In this issue HUGHES FLIGHT as the experts see it!

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AVIATION

The Oldest American Aeronautical Magazine

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With a mighty roar the DC-4 takes to the air... 5600 horsepower unleashed for action! The world's largest commercial land transport is powered by four Twin Hornets, latest in a long line of dependable Pratt & Whitney engines.

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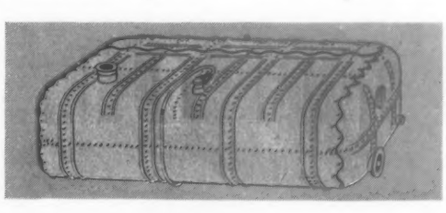
the mainspring of making things

You may think the fifty-odd years of the Aluminum industry venerable, in the light of the comparatively recent events at Kitty Hawk. But compared to crafts built up around older metals and materials, this industry is a yearling.

That explains the emphasis on development of "know-how." From the beginning it has been necessary to develop and spread an understanding of how to use Aluminum. Centuries of experience have accumulated "know-how" for other metals; Aluminum started almost from scratch within the memory of men living.

One kind of "know-how" follows the pat phrase: Learn by doing. Another kind comes from collecting facts about successful practices as they grow up. Both methods are less efficient than developing new methods and new products *deliberately*.

This mode of attack has been applied to Aluminum to the benefit of all concerned. For specific recent examples affecting aeronautics, our shops and mills and laboratories have contributed practical knowledge concerning all methods of welding Aluminum; riveting and other assembly methods have been improved; new protective finishes have been originated, and the need for and handling of standard finishes is better understood.



Many of these advances in technique started in the laboratory, and proceeded to practical test. Improved techniques are spread by applying what was learned yesterday on one job to today's fabrication of another . . . building chemical equipment may result in improved aircraft parts. The search for better techniques fosters advanced equipment, such as the great extrusion presses for strong Aluminum shapes.

Sharing all our "know-how" is a practical cooperation which helps us because it helps our customers. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh, Pennsylvania.

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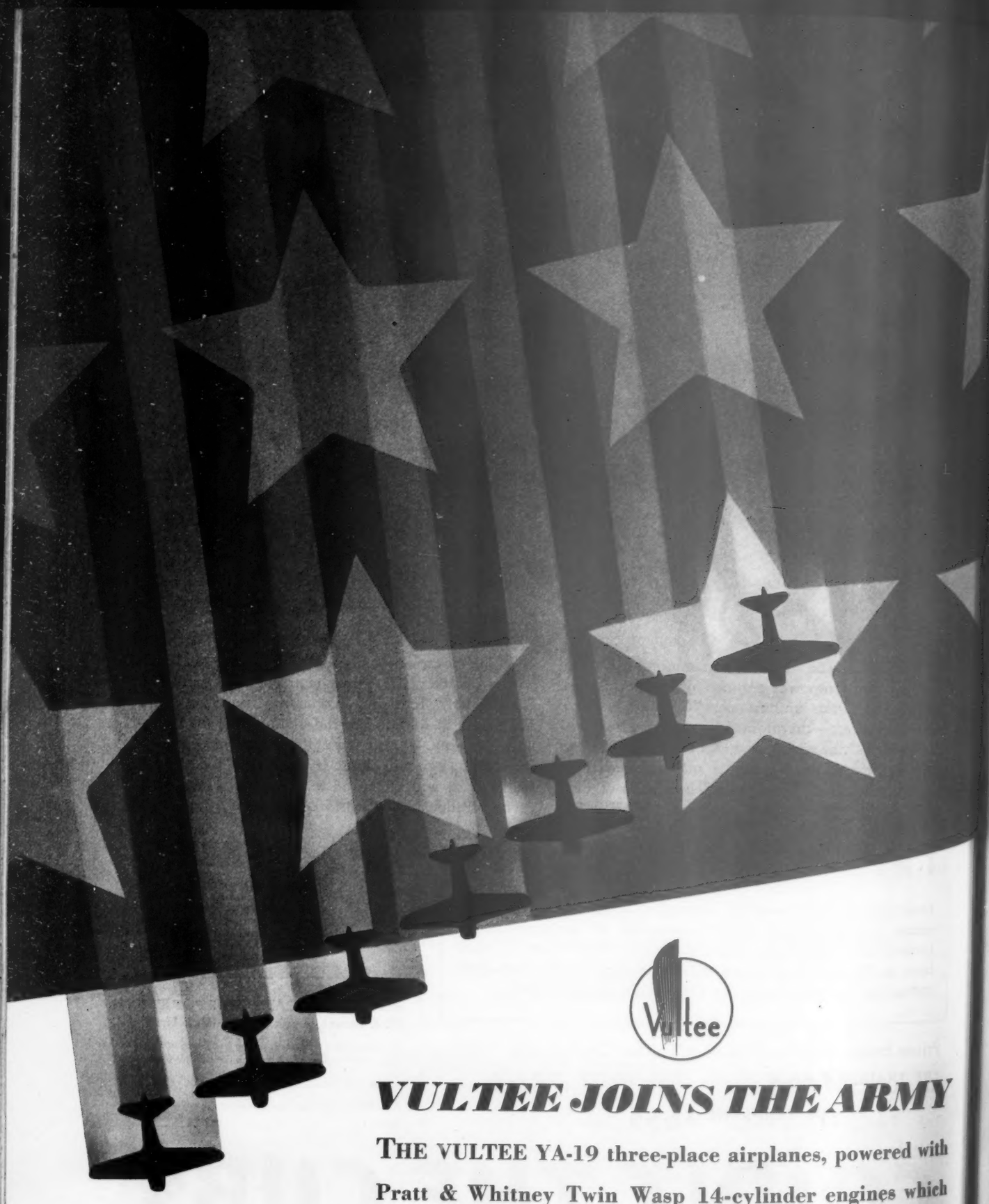

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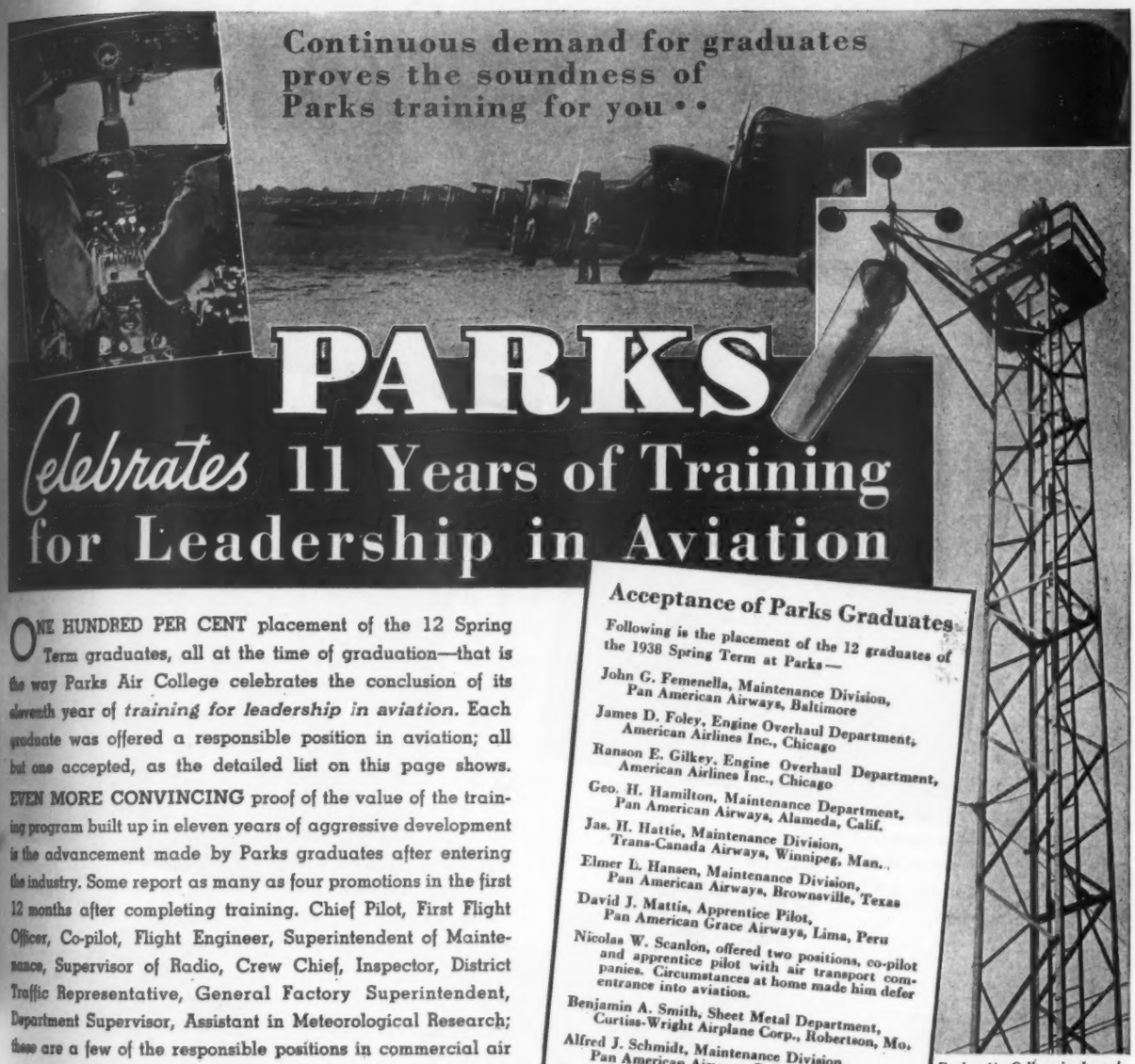
THE VULTEE YA-19 three-place airplanes, powered with Pratt & Whitney Twin Wasp 14-cylinder engines which have been purchased by the United States War Department, will bring to America's National Defense the fastest and largest single-engine attack planes yet produced.

VULTEE AIRCRAFT, Division of Aviation Manufacturing Corporation, DOWNEY, CALIFORNIA



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Celebrates 11 Years of Training for Leadership in Aviation

ONE HUNDRED PER CENT placement of the 12 Spring Term graduates, all at the time of graduation—that is the way Parks Air College celebrates the conclusion of its eleventh year of *training for leadership in aviation.* Each graduate was offered a responsible position in aviation; all but one accepted, as the detailed list on this page shows.

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IF YOU ARE LOOKING far beyond your first job, if you want and expect to accomplish something worth while in aviation, if, in short, you want a satisfying career in this new industry, you will be interested in the foundation training offered you at Parks. The catalog includes complete information about it. The filled-in coupon will bring your copy. It is free.

Acceptance of Parks Graduates

Following is the placement of the 12 graduates of the 1938 Spring Term at Parks—

John G. Femenella, Maintenance Division, Pan American Airways, Baltimore

James D. Foley, Engine Overhaul Department, American Airlines Inc., Chicago

Ranson E. Gilkey, Engine Overhaul Department, American Airlines Inc., Chicago

Geo. H. Hamilton, Maintenance Department, Pan American Airways, Alameda, Calif.

Jas. H. Hattie, Maintenance Division, Trans-Canada Airways, Winnipeg, Man.

Elmer L. Hansen, Maintenance Division, Pan American Airways, Brownsville, Texas

David J. Mattis, Apprentice Pilot, Pan American Grace Airways, Lima, Peru

Nicolas W. Scanlon, offered two positions, co-pilot and apprentice pilot with air transport companies. Circumstances at home made him defer entrance into aviation.

Benjamin A. Smith, Sheet Metal Department, Curtiss-Wright Airplane Corp., Robertson, Mo.

Alfred J. Schmidt, Maintenance Division, Pan American Airways, Brownsville, Texas

William Stair, Meteorology and Communications, Hanford Airlines, Kansas City, Mo.

Barry W. Telfair, Engineering Department, Curtiss-Wright Airplane Corp., Robertson, Mo.

Parks Air College is the only commercial aviation school in the world owning its own airport and devoting all equipment and resources exclusively to school purposes.

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HANFORD AIRLINES

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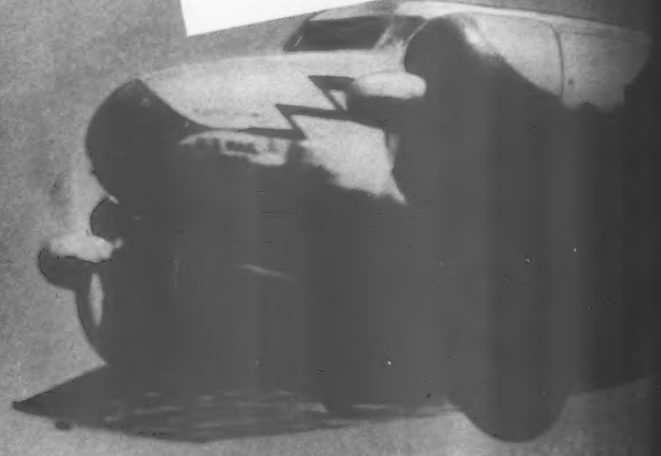
HANFORD AIRLINES



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for year ending July 1, 1938

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Passenger miles flown
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Passenger revenue
379% increase

Mail poundage
140% increase

Express poundage
193% increase

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Then something came over The Screw. Took that slot off his head and put in a patented recess. Changed his habits altogether. Guarantees now never to go crooked again, to use his head and really save some money.

The crew took to him like your wife to a pay envelope. He's on the ball from whistle to whistle, and no foolin'! Makes it easy for the guy that's doing the driving, because you can depend on him to keep the driver from slipping. No more burrs — really a smooth article now. And I don't know of a crooked job he's done since he made his comeback.

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Even when working in an awkward position or on pre-finished parts, it's safe to use faster driving methods. The screw clings to the driver, the driver can't slip from the screw, and the screw can't go in crooked. Freedom from burrs saves an extra filing operation. Result: 10 to 30 minutes saved each assembly hour.

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The recess in the genuine patented Phillips Screw was carefully designed to make the most efficient use of the driver's turning power. It presents three times the contact of the slotted screw, reducing effort required. 2 Phillips Drivers fit 85% screw sizes commonly used.

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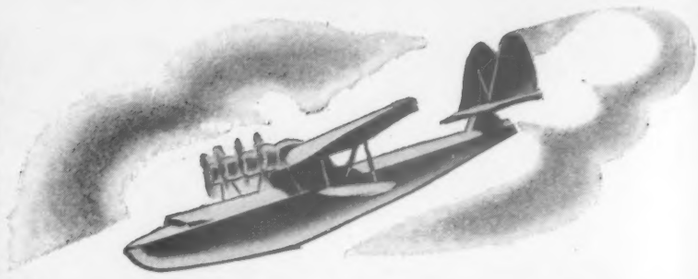
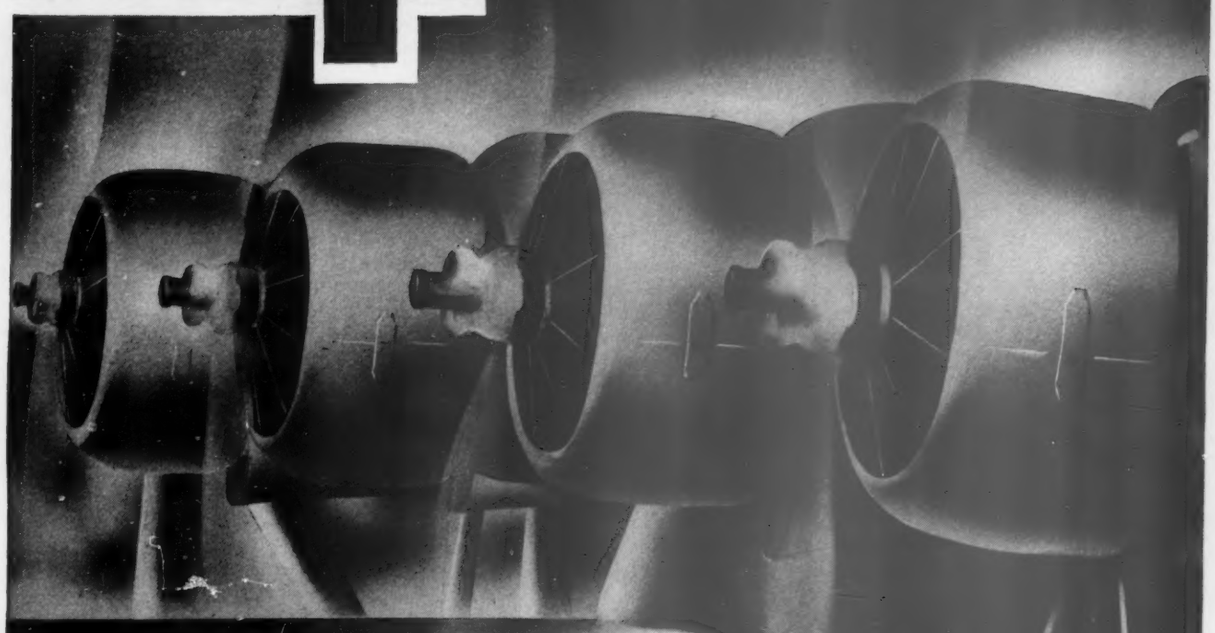


4 REASONS FOR A DEPENDABLE VOYAGE



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THE
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AERONAUTICAL MAGAZINE

AVIATION

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Flight de Havilland "Albatross"

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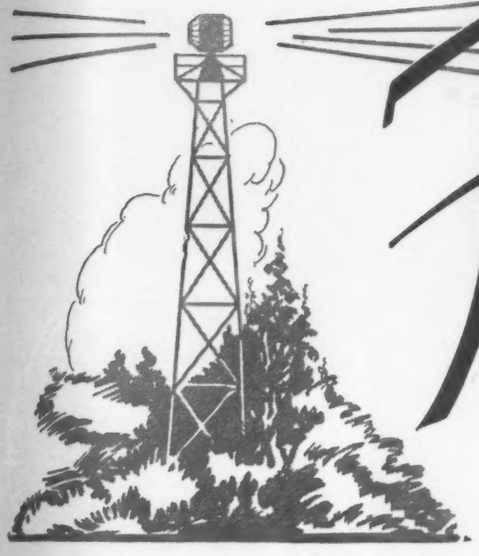

Flashes

From the Skyways of the World

» THIS INDUSTRY can ill afford the loss of a man like Harry Wetzel. He was not only a mainstay of the Douglas organization, but was active in promoting the industry's best interests everywhere. Later in this issue will be found the details of his career, but we cannot let this occasion pass without expressing our sense of personal loss with his passing.

» WE ARE ESPECIALLY GLAD that Harry Wetzel was able to see the first successful tests of the DC-4, for we know how much he himself had put into that development. The nation-wide broadcast on July 7th from the cockpit of the big ship was a fitting tribute to the man who had played a tremendous part in its construction.

» GOING WEST on TWA not long ago, fell in with Carl Cover. We were delighted to hear from him personally of the excellent behavior of the ship as a whole, and were very much interested in his account of the action of the tricycle landing gear. What he told us confirmed our feeling that before many years pass most of our landings and takeoffs will be made from undercarriages of that type.

» AND SINCE THEN we have had an opportunity to get some three-wheeler experience when we flew the latest Model N Waco at Floyd Bennett Field several days ago. Through the courtesy of Ed Erickson we were permitted to make several flights in his personal ship under the coaching of Jack Loesing, one of his pilots. After making only one demonstration takeoff and landing, Jack threw the wheel over and said, "Here, you do it." Since most of our flying during the past twelve months has been riding around in the back seat of transports, we took over with some reluctance, but the minute we pushed open the throttle and started down the runway any fears that we had vanished entirely. It was no trick at all to bring her up to flying speed and lift her off as naturally as you could pull an automobile away from the curb. In the air she was really beautiful to handle. Under Jack's coaching we brought her in at 1,000 ft. over the end of the field, flipped the flaps down, dropped the speed to 80 m.p.h., and simply sat tight while the field came up in our face. Just a bit of a flare before we reached the ground and we were rolling along the runway almost before we realized that we had touched ground. When a ham-handed pilot can land the first time around with as little trouble as that, there is certainly no reason why everyone should not be able to do it. It was a very con-

What's in This Issue

Story of the month is, of course, the Hughes Flight and we are particularly fortunate in being able to present its authoritative background. In the pages that follow will be found Mr. Hughes' own statement on the significance of the flight, and two articles by members of the Aviation staff particularly qualified to discuss the subjects they have treated. Don Fink writes fully of Hughes' radio; Dan Sayre gives details of the flight's unique weather network. . . Braniff Airways has built up an outstanding maintenance shop at Dallas. Our West Coast editor describes what he saw there on a recent visit and gives an insight into the maintenance philosophy of Reagan Stunkel. With long-range over-water transport in the offing, the problem of the relationship between range and payload is important. Mr. John Schairer, as a member of Consolidated's engineering staff, has made an extensive study of the problem and outlines the methods to be followed in making range calculations . . . Airplane-of-the-month is the Curtiss-Wright Model 20 Transport, described for the first time in an exclusive article to AVIATION by Curtiss-Wright's director of engineering, T. P. Wright. . . . Other Flying Equipment includes the first report of Menasco's 'Uni-Twin" power plant; the A T C'd Aeroneer by Phillips; and the first description of an important flight control instrument developed by Irving Metcalf and the Fairchild Aerial Camera Company.

AMERICA'S PILOTS IN THE KENDALL HALL OF FAME

EARL ORTMAN and his MARCOUX-BROMBERG RACING PLANE

On May 30, 1938, Earl H. Ortman, Chief Pilot of Speer Flying Service, San Diego, Calif., established a new world's closed course speed record of 265.539 miles per hour when he won the 150-mile Golden Gate Exposition Trophy Race at Oakland in his Marcoux-Bromberg racing plane, using Kendall, The 2000 Mile Oil. On June 1, Mr. Ortman again used Kendall Oil in establishing his official Oakland to San Diego record of 1 hr., 48 min., 1 sec.

IN THE Pacific International Air Races, held at Oakland Calif., 15 out of a possible 16 winning pilots used Kendall, The 2000 Mile Oil, in their planes. That 93.75% of the winners in these grueling contests of speed and endurance relied upon Kendall Oil for dependable lubrication is conclusive proof of Kendall's quality. Kendall is refined exclusively from Bradford, Pennsylvania Crude . . . the costliest crude in the world. Special Kendall refining processes develop to the full its native lubricating excellence. The premium quality oil thus obtained is protected from contamination by individually numbered, refinery-sealed cans. You will find Kendall, The 2000 Mile Oil, at most airports throughout the country.

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vincing demonstration and re-affirmed our conviction that the three-wheel boys have really got something.

» EVERYONE in this aviation business should make a point of visiting the Naval Reserve base in his vicinity every once in a while, for the quality of work done and the ship-shape way in which ground and flying equipment is kept is an inspiration to anyone who has anything to do with aircraft. Lt. Commander Roland P. Kauffman, new skipper of the U.S. Naval Reserve base at Floyd Bennett is certainly to be congratulated upon the appearance of the base—but the same can be said of all Naval Reserve bases that we have ever seen, from Miami to Seattle.

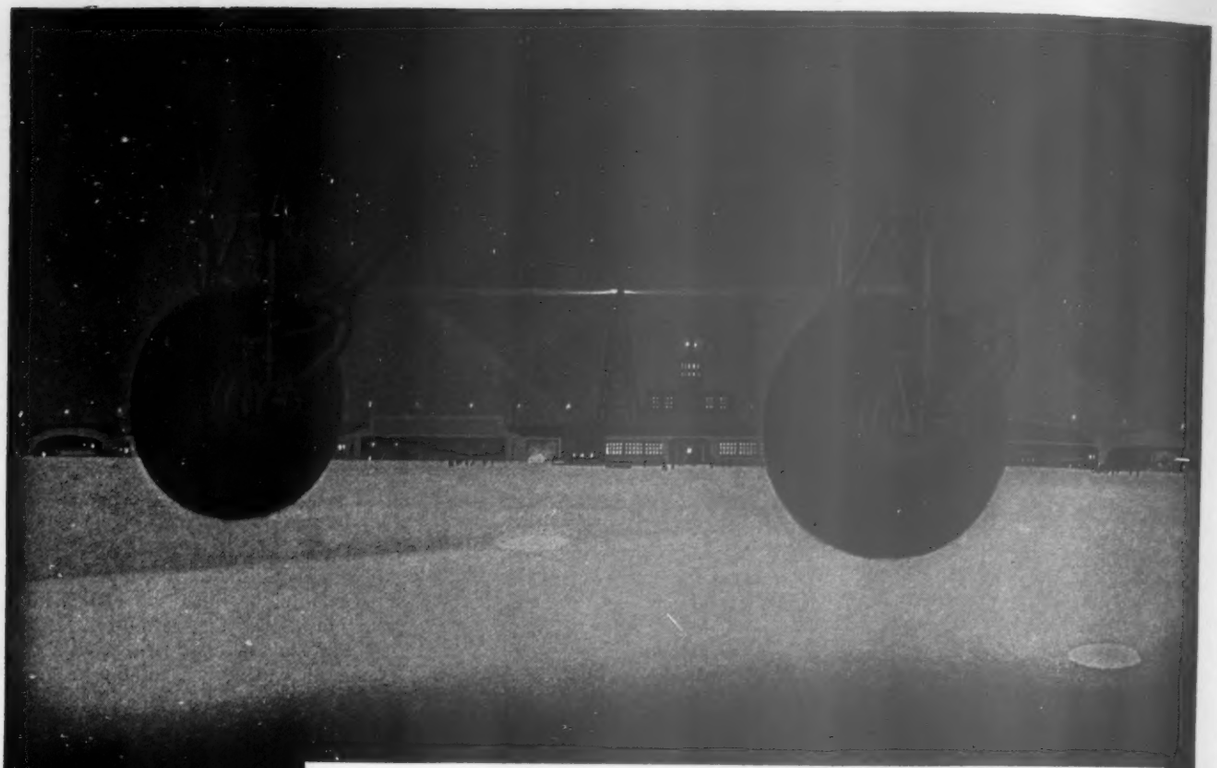
» ALTHOUGH BOOK NOTICES are not normally a part of this Department, we got such a kick out of reading Commander Edward Ellsberg's "Hell on Ice" that we want to mention it in passing. The story of the voyage and loss of the "Jeanette" and the tragic story of Commander DeLong and his party, point up the sharp contrast between Arctic exploration in the past and the present. Frozen in the ice, the "Jeanette" drifted aimlessly at the mercy of the ice-pack, only to be crushed after eighteen months. After the loss of the "Jeanette" the crew by tremendous effort and terrific hardship could make good only a mile or two a day over the ice fields. Stack this up against the recent flights of the Russians over the Pole and of the work of Ellsworth and Sir Hubert Wilkins. And in the near future it is not impossible that Moscow-New York air liners will be passing on regular schedules over the Lena Delta where disaster finally overtook the DeLong party.

» FOLLOWING THE STYLE recently set by Hall Hibbard, Vance Breese, well known test pilot, retired to the Good Samaritan Hospital in Hollywood, for an appendectomy. At last reports he was doing well. Removal of one very unhealthy appendix disproved Vance's long standing contention that repeated terminal velocity power dives and 9G pull-outs had caused his appendix to shrivel up and vanish from fright.

» THE NEW YORK UNIVERSITY CLUB was the scene of a pleasant little dinner on July 6th, given by the brothers Townsend and Nicholas Ludington to give Jack Bartow an opportunity to demonstrate to air line and insurance executives the advantages of his control-light landing system. Chief feature of the scheme is to provide lighting of uniform intensity along the plane of the center line of a runway. The Bartow scheme eliminates confusing interference of flood lights, and is said to be fog penetrating to a remarkable degree. Plans are under way to make a test installation of Bartow lighting at Indianapolis under the supervision of the Bureau of Air Commerce. Details of the system will be available in an early issue.

» IN ONE of the large eastern cities an ordinance has been passed to name the municipal airport, now under construction, in honor of the mayor. Being familiar with the experience of a large southern city in a similar case, we'd like to suggest naming the airport *after* it has been completed. In this other case the politician for whom the airport was named came into great disfavor with the citizenry a few years later and it was decided to change the name of the airport. An investigation showed that the politicians name had been stamped in every brick and cut into the stone work of every building, worked into the tile design of the floors, and woven into the linen and etched into the glasses of the restaurant. The citizens had the choice of leaving the name unchanged or building a new airport.

"Maguire made himself a tricycle landing gear with his grandfather's wooden leg."



WHEELS DOWN... THEN LANDING IMPACT...
THEN *Braking!*

In no other form of transportation does so complete a change of conditions and of mechanical functions take place as at the moment of ground contact in an airplane. In this instant the shock of landing impact has been absorbed. Here flight characteristics become unimportant; accurate steering and quick, smooth stopping become vital. Up to a dozen tons must be stopped from mile-a-minute speed in a few seconds. The pilot's feet have sought his brake pedals in anticipation. He applies pressure judiciously, firmly. Air and ground resistance both affect his direction; he varies his braking pressure to compensate, bringing the great plane to a smooth, perfectly controlled stop. He *steers* with his Bendix Brakes. They respond with utmost nicety and tremendous effect, because Bendix engineers, with the fund of facts on landing gear design and performance at their disposal, have done a proper job. They stand eagerly ready to do the same for every aircraft builder.

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Side Slips

By
ROBERT
OSBORN

» In recent years the Boeing Company has developed a novel custom in regard to their large airplanes. As soon as they roll a new giant out for flight test Company officials announce to an amazed aeronautical world that, shucks, they are building a bigger and better design in the shops already. At first we thought Boeing had this giantism complex because their engineers didn't like working with decimals, or because of a factory full of ex-structural-steel workers who couldn't handle metal less than a half

inch thick, but now we think we know the real reason. They're hoping to build a ship big enough to really impress test pilot Ed Allen.

They should be able to achieve this ambition in another design or two as their ships are almost large enough now to be considered as possible W.P.A. projects.

» A few years ago this column waged what appears to have been a successful campaign to educate newspaper writers on certain matters pertaining to vision. In reporting the numerous attempts to break the automobile speed record at Daytona Beach or on the Bonneville salt flats the favorite phrase of the newspaper men was that the car flashed past them so fast it could be seen only as a blur or a streak. To help correct this sad condition we offered to provide observers from the press boxes at the National Air Races who were able to see airplanes quite plainly as they passed the stands at speeds about a hundred miles an hour faster.

Now it seems we must take these reporters in hand again as lately they have had every mass flight of airplanes "darkening the skies." We've witnessed many mass flights in our time, some of which involved nearly all the airplanes of the Army and Navy, and never once have we seen the skies darkened. On the contrary we recall being able to read newsprint clearly, and being able to see gents of such willowy proportions as C. B. Allen and Shorty Schroeder easily at distances of one hundred feet.

Probably the air forces of Soviet Russia and some other European powers could do a better job of sky-darkening if they flew all of their ships at once but even then we doubt if any chickens go to roost or emergency squads of lamp-lighters rush through the city streets.

So, if reporters persist in using this phrase in the future, we're going to write hot letters to their editors demanding information on just how many foot candles of illumination was lost.

» Since ancient times it has been the custom to commemorate heroic accomplishments with memorials which feature perpetual flames,—to be kept lighted for all eternity. If the patriotic societies of this country ever consider a joint memorial for all of the pioneering aeronautical flights which have been made we are going to suggest a minor variation of this time-honored scheme of perpetual fires. We think it would be much more appropriate from an aviation standpoint to have a statue of Grover Whalen, with his hand extended in a welcome greeting, and with a perpetually fresh carnation in the lapel button-hole of his sartorially perfect ensemble.

» Historical Question Now that we have air-cooled engines of 1,500 hp in our commercial airplanes and probably still higher ratings available for military airplanes, who remembers the days when everybody agreed that air-cooled engines were probably alright up to about 200 hp, but liquid-cooled engines would be necessary for any powers above that?

» Also Historical In these days of automatic, controllable, full-feathering, constant-speed, slinger-ringed, superheterodyne, hot-and-cold-running-water propellers, many Early Birds probably wish for a return of the good old days when propellers were whittled out in his spare time by that fellow down in the end hangar,—and

the best propeller was the one giving the highest reading on a spring scale tied to the tail of the ship.

» An Associated Press dispatch tells of an agreement between Great Britain, France and the United States to set the limit of battleship size at 45,000 tons and of guns at sixteen inches. If the purpose of this announcement was to impress any potential enemies who are showing signs of getting uppity, we think a good publicity man could have improved it. For instance these powers could have agreed just as easily that each battleship have only two planing steps on the hull and carry not more than six four-engined flying-boat bombers on catapults.

★ AVIATION *for August, 1938* ★ ★ ★ ★ ★

The Appoint—"mints with the hOle."

THE LONG AWAITED WHITE HOUSE ANNOUNCEMENT of personnel for the Civil Aeronautics Commission left us in a flat spin. We were prepared, of course, for a certain amount of deviation from ideal in the makeup of the Commission. A perfect lineup would have been too much to hope for. We were optimistic enough, however, to think that there would be enough general strength in the makeup of the Authority to more than offset the weaknesses. But adding up the scores as charitably as possible, the aviation talent in the C.A.A. sloshes about like a gallon of gas in an empty tank.

The fine Italian hand of Jim Farley seems definitely in evidence in the debacle. He has simply added another notable chapter to his anti-aviation record. But that the appointments are one hundred per cent wrong is, of course, as unlikely as their being completely right. It is the shocking lack of balance in the Commission that knocked us for an inverted loop.

The choice of administrator was a real surprise. The man who is ultimately responsible for such highly technical matters as passing on the design and airworthiness of aircraft, of issuing pilots' licenses, of supervising radio installations on airways, and airports, should at least have had some prior contact with such matters. Mr. Hester has done an excellent job in his own field, but his experience has been entirely in the legal aspects of the Treasury and other government departments. True, he did yeoman service in drafting the Lea bill and doubtless deserved consideration, but his background would suggest an assignment as legal adviser, or even as a member of the Commission, rather than the job of its chief executive. His intimate knowledge of the processes of government should be an asset. Mr. Hester has a doubly difficult job on his hands of selling himself to a skeptical industry and then proving that he will carry out his assignment according to his own lights, and not as a rubber stamp for the White House.

With the selection of the chairman we have less criticism. As the creator and exploiter of "Life-Savers" Mr. Noble is a man whose proven business and executive ability can contribute a much needed element into aviation affairs at the moment. At least he has had some contact with the industry through his financial activities and ownership of several airplanes. With a properly balanced Commission behind him his fresh approach could be a tremendous asset.

Little objection can be raised over the appointment of Harllee Branch. He has had long and useful experience with the air mail and can make a real (although specialized) contribution. His appointment was expected and will doubtless be generally approved by the industry. He knows little of the technical aspects of airplane operations, however, and his obviously close connection with Boss Farley is a bit disturbing.

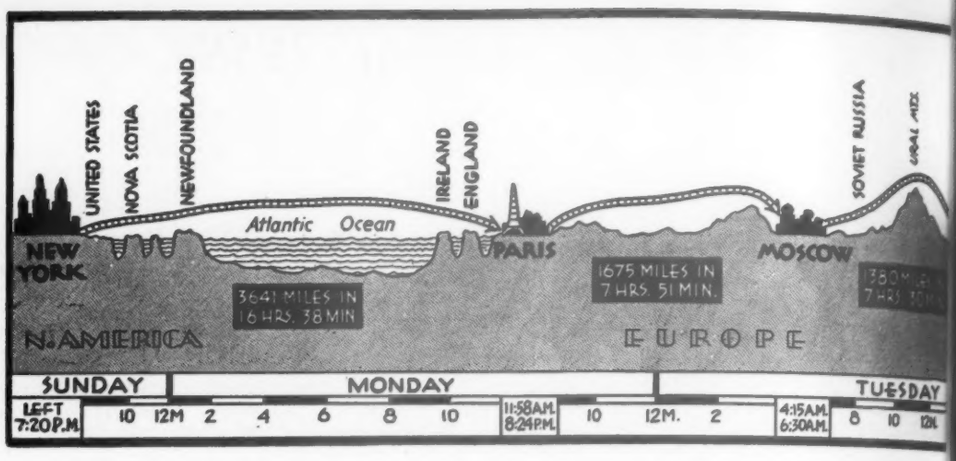
Mason is the only member who has had any really adequate aviation experience, but it has been pretty much one-sided, confined almost exclusively to Pan American's problems in the Carribean. He has executive talent and business ability however.

The other two appointments look pretty doubtful as far as aviation is concerned, and are chiefly responsible for throwing the commission so completely out of balance toward the political side. Mr. Ryan is a former Federal Power Commission lawyer (allegedly a Left Wing New Dealer with a yen for public ownership) but with no aviation experience whatsoever as far as we can discover. Mr. Hinkley claims a long standing interest in aviation, is known to be a persistent airline rider, and once had an interest in a now defunct flying service in Ogden, Utah. Latterly he has been WPA Administrator for five western states, and is said to be a pal of Harry Hopkins. At best, his total aviation record could be outweighed by a hundred more qualified men that we could name. The substitution of one sound aviation man of long experience for either of these two would have restored a certain semblance of balance to the whole, and would have changed the situation.

The safety board appointments, however, make some sense. Both Hardin and Smith are men of practical experience, one as an airline pilot (as required by the law), and the other as an airport engineer (WPA). Much will depend on the third appointment. A trained aeronautical engineer with sound practical experience would round out the safety board very neatly—another politician would ruin it. A technically strong safety board which sees in its duties a great deal more than investigation of accidents, can, as a technical advisory body, do a great deal to bolster up the Authority.

Well, the law is now the law, and the Commission is now its administrator, and we are going to have to live with both of them for a long time (unless the Senate refuses confirmation next January). Instead of being able to take off immediately on a new program of aviation for America as we had confidently hoped, at best we have got on our hands another long-term educational job that must be completed before any really worth while results can be expected. We will all have to be extremely patient and extremely cooperative, as it will take this Commission a long time to get its feet on the ground and find out what this business is all about.

Tomorrows Clippers—Four answers to the Pan American specifications for larger trans-oceanic boats. Top to bottom: Boeing, Consolidated, Sikorsky, and Douglas. All but the Consolidated have six engines.



91 Hours, 8 Minutes, 10 Seconds

EVERYBODY'S WORLD is a little different this month thanks to aeronautical progress. Even the housewife of Keokuck, Iowa, who will never travel farther than Chicago has remade her picture of the formidableness of the earth's distances. If that young Hughes can get to Siberia in less time than it takes Cousin Gertrude to drive down from Duluth, why, it makes Europe and all those foreigners seem like they were just living over in the next state somehow.

To the people who travel for business, for pleasure, for education, air transport is some shades surer, safer, dramatically more swift. As the world's air lines take up what is now certain to be their last pre-scheduled season in the North Atlantic, the world conquest of the airplane has been driven into the public consciousness like a spike hammered into a cigarbox.

AVIATION has spared no effort to bring its readers the complete professional background of this Event-of-the-Year. On following pages are articles on Hughes radio and weather forecasting set-ups. On page 49 is a description of one of the trip's prime navigation assets—the Fairchild-Maxson position reckoner. In the AVIATION NEWS is a complete review of the flight's aeronautical background and lessons together with a number of photographs of various phases of the flight.

Meanwhile there could be no editorial comment we could make of half the stature of Hughes' own summary of his feat as he delivered it over NBC in response to his New York ovation. It might stand for all time as the professional airman's evaluation of the achievements of the individual aviator.

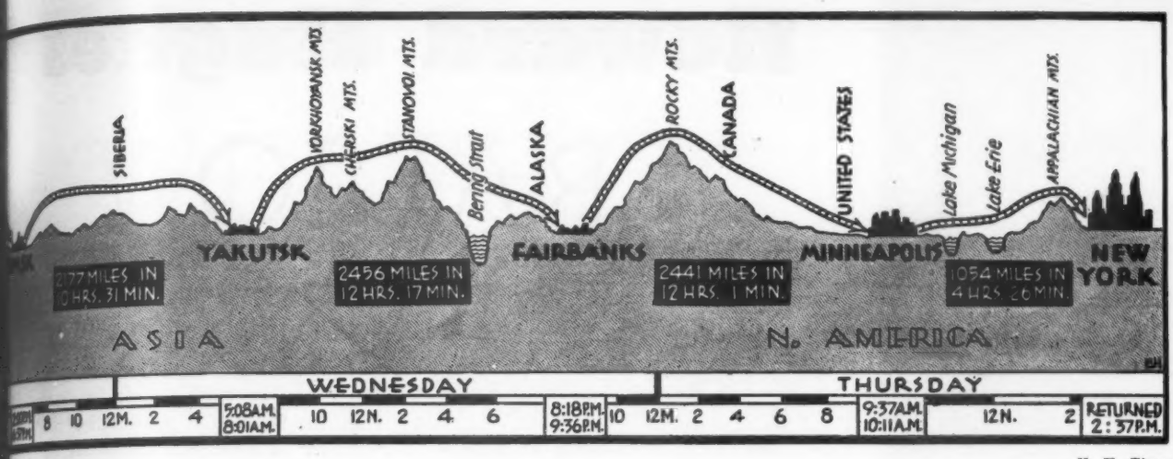
Gentlemen we give you Mr. Hughes.

I AM NOT very good at making speeches, and I have consented to make this one only because there is one thing about this flight that I would like every one to know. It was in no way a stunt. It was the carrying out of a careful plan and it functioned because it was carefully planned.

We who did it are entitled to no particular credit. We are no supermen or anything of that sort. Any one of the airline pilots of this nation, with any of the trained army or navy navigators and competent radio engineers in any one of our modern passenger transports, could have done the same thing. The airline pilots of this country, who in my opinion are the finest fliers in the world, face much worse conditions night after night during every Winter of scheduled operations of this country.

If credit is due any one, it is due the men who designed and perfected to its present remarkable state of efficiency the modern American flying machine and its equipment. If we made a fast flight, it is because many young men in this country went to engineering schools, worked hard at drafting tables and designed a fast airplane and navigation and radio equipment which would keep this plane upon its course. All we did was to operate this equipment and plane according to the instruction book accompanying the article.

The most advanced and newest equipment developed by navigators and radio engineers furnished me with such accurate information as to the position of the plane at all times that I estimate for the total trip we traveled



N. Y. Times

only twenty miles more than a direct course between the various points at which we stopped.

The airplane was fast because it was the product of over 200,000 engineering hours. Young men trained mostly at the California Institute of Technology, working in a factory in California, put in 200,000 hours of concentrated thought to develop that machine.

Flying at all times at the altitude which was most favorable to the operation of the plane with the load aboard at that particular time—the load naturally varying continually as the fuel was consumed—and using the amount of horsepower at all times which would give the greatest range, we completed this flight without at any time using more than 590 of 625 horse power per engine approved by the Department of Commerce for normal cruising. In other words, this was in no way a race or a straining of the machine or its engines. The airlines of this country, using those same motors, cruise frequently at 625 horse power.

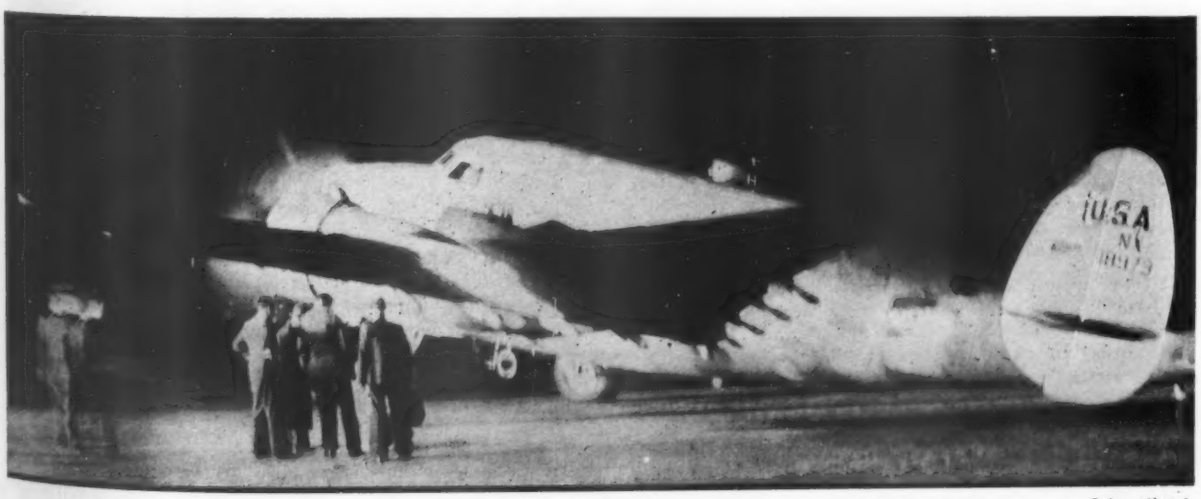
There is one thing about the flight which pleases me more than the actual time which elapsed, that is the fact that we made no unscheduled stops, we arrived at every destination within a few minutes of the time which we set as our arrival time. . .

Further than that, I hope that this flight may have served in a small way to re-establish the United States in friendly competitive flying activities to the point it once held. The airplane was invented and originated in the United States, yet since then, the countries of Europe have taken from us one by one every record of major importance.

The speed record for seaplanes is held by Italy, the speed record for land planes by Germany, the altitude record is held by England, and Russia, with its magnificent flight of last year, will probably hold the distance record for a long time to come.

If this flight may have demonstrated to Europe the fact that American engineers and American workmen can build just as fine and just as efficient an airplane and its equipment as any other country in the world, then I certainly will feel it has been well worth while.

And if possible through this the European nations may realize, even a little more than they already do, that our planes are inferior to none, and if our sales of airplanes to European nations may increase only a little bit, thus putting to work more men in the aircraft factories in this country, then I shall feel more than ever that the flight was worth while.



Hughes in Paris

International

Howard Hughes RADIO

By Donald Fink
Radio Editor, AVIATION

Charles Perrine, radio engineer for Hughes Aircraft, helped Richard Stoddart on the Lockheed's equipment, then set up and ran the ground network throughout the flight.

TO GET THE COMPLETE RADIO PICTURE of the Hughes flight, it is necessary to cover it from two different points of view. The first, perhaps of the greatest interest, is the installation in the plane itself. The second covers the arrangements made for contact with the plane from the ground.

The installation in the airplane is one of the most complete ever attempted and was designed to fit all circumstances that could possibly be foreseen at the beginning of the flight. To accomplish this a wide variety of requirements was set up and equipment developed and planned to best fit them. The thing of most importance was to always have available, complete duplicate equipment to take care of any failures and it is for this reason that three transmitters were taken on the plane.

The main transmitter was a 100-watt affair designed and built by the Hughes Aircraft Company. This transmitter operated on CW, ICW and radio phone. It operated on 18 crystal controlled frequencies, ranging from 23,100 kilocycles to 333 kilocycles. The audio system employed 100 per cent plate modulation and was designed to minimize motor noise. This transmitter was located within easy reach of the operator in the forward radio compartment so that normal frequency changes could be made in minimum time. It was this transmitter that was used throughout the flight for almost all communications work and relay broadcast work.

The second transmitter (a Bendix) was also of 100-watt power with 8 frequencies, duplicating certain of the frequencies used in the Hughes transmitter. It was intended as a first line of defense in case of failure in the main transmitter.

The third transmitter was combined with a receiver to form a complete emergency station. It had a power of 15 watts, CW or ICW on four crystal controlled frequencies running from 16,000 to 500 kilocycles. The receiver had a similar frequency range. The power for operation of this transmitter was available from three different sources to take care of various forced landing situations. A hand driven generator could have furnished power to both the transmitter and the receiver indefinitely, and in case of any damage or loss to the hand driven generator, sufficient battery power had been built into the unit to operate the transmitter for several hours at full power and the receiver for about a day and a half. Complete accessories, such as telegraph key, waterproof headphones, antennae, etc. were attached directly to the unit to make up a total dimension of approximately 15x8x10". All controls and the container for the emergency transmitter were thoroughly waterproof to withstand long immersion, the whole being sufficiently buoyant to float easily. The total weight was approximately 34 lbs. exclusive of the hand driven generator. A kite and a balloon were available to raise the antennae in case no other support was obtainable.

The receiver complement included two Bendix super-heterodynes covering both low and high frequency. One of these was normally used for communications work and the other for direction finding in conjunction with the Bendix loop unit. The third receiver was the emergency receiver already mentioned. The fourth was a Fairchild loop receiver used with the Kruesi radio compass.

The location of the equipment in the plane was, of course, very important from the standpoint of operating convenience and for this reason the majority of it was located in the radio compartment. The only units located in the tail were the 100 watt auxiliary transmitter and one Bendix receiver. The operation of all the units was made extremely flexible by the use of interlocking relays to switch the two trailing antennae to the proper units without trouble at the desired time. The two trailing antennae comprised a Heintz & Kaufman electric reel for the high frequencies and a hand operated reel for the low frequencies with automatic provision for switching to either of the two reels when it was desired to do so.

The electric reel was coupled to the main transmitter up forward by means of a 100-ohm concentric transmission line provided with a means of indicating to the operator when the antennae termination was correct, as shown by the absence of standing waves on the line. The antennae length could be made almost any odd number of quarter waves long with little trouble. By varying this number of quarter waves the directivity of the antennae could be controlled, and the power radiaton in certain directions, therefore, could be practically doubled. A feature of the high frequency antenna was the fact that it was entirely clear of the ship; the concentric transmission line continuing right out through the tail cone.

The inter-phone system was also of great interest because of its flexibility. It operated between three positions in the plane—the stations of the pilot, the radio operator and the navigator. The pilot and the radio men could not only communicate with each other and the navigator but could switch either head phone of their split head sets so as to monitor any of six circuits. The inter-phone circuit was also arranged to automatically break into any of the above circuits when intercommunication was desired.

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Howard Hughes WEATHER

By Daniel Sayre

Associate Editor, AVIATION

William C. Rockefeller, Hughes technical advisor, worked on many phases of early preparations, then went to New York to make daily world wide weather maps.

THE PROBLEM of providing weather information for a flight which was so extensive as Howard Hughes' round-the-world flight, is one which requires considerable organization, designed along lines which will lead to speed of execution. Quite naturally the first immediate need which presented itself was that of collection of weather observational data sufficient to allow a thorough analysis. In order to provide this data W. C. Rockefeller set up a rather extensive radio station at the World's Fair, whose only purpose was to receive the regular scheduled transmissions of weather data from certain stations in various parts of the Northern Hemisphere. In order to facilitate the organization of the radio phase of this project, this receiving station was combined with the communications station, and the whole thing placed under the direction of Mr. Charles Perrine. He also provided for weather teletype facilities, to simplify the problem of obtaining observational data in North America.

There are several regular radio transmissions from numerous stations in Europe which provide partial data, but in order to preserve the safety of the flight from this standpoint it was quite necessary to have the maximum of completeness in the data received. Thus it was necessary to receive all the transmissions from stations in London, Berlin, Paris, Rome, Moscow, Manila, Honolulu, San Francisco, and Arlington, to obtain sufficient coverage of the vast expanses of ocean and land other than the North American continent. One of the best examples of the extent of the data received lies in the transmission which were recorded each day from Moscow in order to provide a single forecast for one leg of the trip in Russian territory. The transmission from Moscow, lasting one hour and twenty minutes, was comprised of over 250 stations in Russia and Siberia alone, with a total of over 10,000 numbers recorded, all representing certain items of weather information and coded in the new international code. At least one world map was compiled each day at the World's Fair headquarters, usually based upon the observations taken at 0000 GMT simultaneously all the way around the world. Statistically the observations were for the major part included in the area north of 20 degrees north latitude, and south of 80 degrees north latitude.

The collection of the above data required about six hours of nearly steady operation of four receivers, with four operators all tuned to different stations. In order to provide against such contingencies as local thunderstorms in the region of our headquarters, with the resultant interference, one of the amateur radio stations in the communications network, W2UK, owned by Ralph Thomas at Quogue, Long Island, stood ready at any time to tune to any broadcast with which they might be having difficulty at headquarters. A direct telephone line between World's Fair headquarters and W2UK allowed it to obtain such data after it was received. This provision prevented any suffering from loss of data on any map during the entire project.

As these broadcasts were received it was necessary to decode the data and enter the observations on the maps. A staff of four men with staggered shifts helped Rockefeller in doing this work. That data was recorded first which was most pertinent to the particular leg of the flight in question, so that the partial map could be analyzed and the forecast prepared at the earliest possible time. However, the entire Northern Hemisphere map was completely analyzed within seven hours after the time of the observations.

The entire organization described above was set into operation two weeks before the start of the flight from New York in order that a time might be chosen which would be most suitable for the flight. In choosing this time it was necessary to consider several features. Foremost among these were favorable winds and flyable weather across the Atlantic to Paris, but at the same time keeping in mind the longer range outlook beyond Paris, particularly in the Siberian and Alaskan areas which are oftentimes the most critical areas from the weather standpoint. As it turned out, these regions were quite satisfactory for the flight, although the day following the departure of the flight from Siberia, the weather in that area became distinctly adverse.

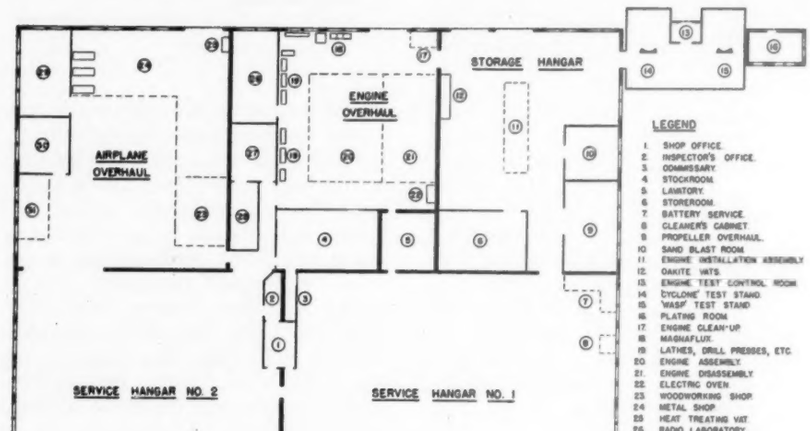
The points which were covered in the forecasts themselves were of course ceilings, height of clouds, state of weather, and particularly winds. During the Atlantic flight to Paris, the synoptic situation was comprised of the permanent Azores high which was extended rather far northward, together with a rather deep low north of the British Isles, with its attendant warm and cold fronts. As a result of the combined circulation of these two systems the winds were quite favorable for the entire flight, although the ceiling at Paris was reduced to about 1,000 feet, with rain, at the time of landing. This was, however, as shown by the result, entirely flyable weather.

At least one forecast was provided for each leg of the trip and was communicated by commercial radio agencies to the next stop in order that

(Turn to page 77)

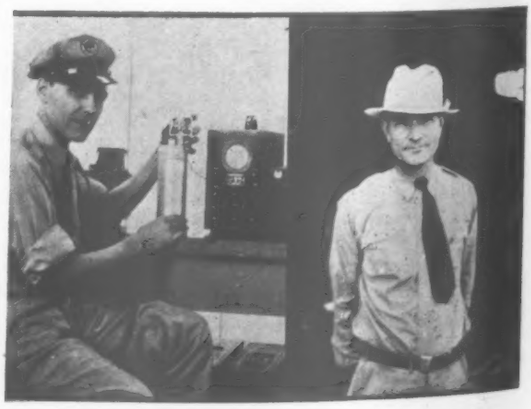
Checking Up

Maintenance shops on Love Field, Dallas, take care of ships which fly 10,000 miles a day.



ONE OF THE MOST FASCINATING and inspiring chapters in the record of airline maintenance is being written in the shops of Braniff Airways, at Dallas, Texas. From the original Stinson Detroiter, of mixed construction, the Braniff fleet has grown through acquisition of all-wood Lockheed Vegas, all-metal Lockheed Electras, to the present fleet of Douglas DC-2s and Lockheed Electras. As the number of planes in service has grown, and types of planes used has changed, the Braniff shops have established an enviable record for reliability of equipment in service and low cost of maintenance. Plane hours flown per day have increased from an average of less than three to an average of more than eight. And as new planes, engines, and accessories have been handed the Braniff shops for maintenance, change has become a fetish with the organization. Every move made by Braniff maintenance men seems to have back of it the thought that to-day's best methods will not be good enough tomorrow.

Hub of Braniff's maintenance wheel is Reagan C. Stunkel, maintenance superintendent. Around himself he has built a team that any maintenance man, and, indeed, any employer of men, might well envy. To these men the jobs they are doing are the most



Walter Hendricks
Superintendent Instrument Shop

Stanly Shatto
Overhaul Superintendent

at BRANIFF Airways

THE B LINE

Cutting Through the Heart of America from Chicago to the Mexican Border, Braniff Makes Connections with Every Major System on the Continent.

romantic and inspiring in the world. Each eats, sleeps and breathes his special brand of maintenance. And together they tackle the present job and the future problems with a fanaticism which will tolerate nothing short of perfection.

Space does not permit a biography of all the Braniff maintenance men, or a very complete record of the achievements of Stunkel himself. Reagan C. Stunkel is not yet 30 years of age. At the age of fifteen he had soloed and was making parachute jumps and giving flight instruction. At seventeen years of age he was chief mechanic and relief pilot for Saline Airways. He worked his way through school by doing wing walking and parachute jumping during vacation periods. After high school went on to several colleges at which technical training was secured. At twenty years of age Stunkel was superintendent of maintenance for Bowen Airlines and serviced the Bowen planes for five years without suffering a single accident, although working without many of the facilities now considered essential to proper maintenance work. Before coming with Braniff Airways to take charge of maintenance Stunkel had worked with Southern Air Transport, Gulf Coast Airways, American Air Lines and Delta Airlines, in addition to those already mentioned.

With such a background of practical experience and technical training Stunkel has combined a rare quality for selection of men qualified as he is to personally do the jobs to which they are assigned. The result has been a philosophy of maintenance that is somewhat different from that of some other such organizations. In the Braniff maintenance system every move seems directed at increasing the responsibility and the initiative of the individual, whether he may be an apprentice, a crew chief, or the shop superintendent. The human element, and reliance on it is everywhere stressed. When Stunkel took charge of Braniff maintenance it is significant that he completely eliminated 26 of the forms then in use in connection with servicing, maintenance, inspection, etc. A study of all maintenance systems was made and the various forms finally adopted were developed

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The new instrument shop, with its oscillograph, synchrotone and sensitive manometer.

The Boss—Reagan Stunkel
Braniff Maintenance Superintendent

George Carroll
Superintendent Airplane Overhaul

Frank Dyer
Radio Maintenance

E. H. Bradley
Chief Inspector

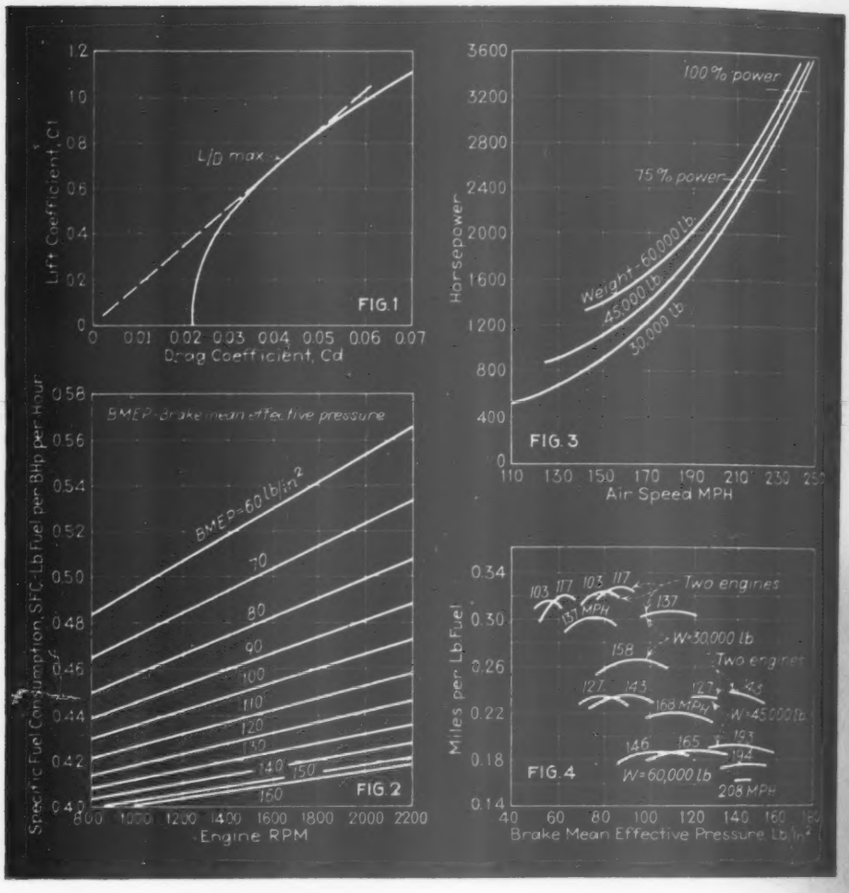
By

George S. Schairer

Consolidated Aircraft Corp.

The big questions asked about big airplanes today are, How far will they go? and How much will they carry that far?. Another question which is almost secondary in importance is, How long will it take them to get there?. The purpose of this article is to indicate a way to answer these questions.

RANGE vs. PAYLOAD



THE RANGE OF AN AIRPLANE is affected by its weight, speed, fuel load, engine R.P.M. and other factors. The effect of each item can best be studied by finding just how each affects the miles per lb. of fuel of the airplane. The miles per lb. of fuel, or specific range, is equal to the speed in miles per hour divided by the pounds of fuel used per hour. The power required at any given condition of speed and altitude is given by the familiar formula,

$$\text{Hreq} = \frac{Cd \times \frac{\rho}{2} V^3 \times S}{550} \qquad (1)$$

The power available from the engine-propeller combination is HP av=Propullsive Efficiency η x BHP per engine x No. engines. In level flight the power available must be equal to the power required. HPav= HPreq and

$$Cd \times \frac{\rho}{2} V^3 \times \frac{S}{550} = \eta \times \text{BHP/Eng.} \times \text{No. Engines} \qquad (2)$$

The seldom used propellor power coefficient

$$Pc = \frac{P}{\frac{\rho}{2} V^3 \frac{\pi}{4} D^2} \quad (P = BHP/\text{Eng.} \times 550)\ (D = \text{Prop. Diam.}) \qquad (3)$$

is useful at this point. The BHP/Eng. in equation (2) will be replaced by

$$\text{BHP/Eng.} = \frac{Pc \times \frac{\rho}{2} V^3 \frac{\pi}{4} D^2}{550}, \text{ thus}$$

$$Cd \times \frac{\rho}{2} V^3 \times \frac{S}{550} = \eta\, Pc \frac{\rho}{2} V^3 \frac{\pi}{4} D^2 \times \text{No. Engines} \div 550 \qquad (4)$$

This equation is simplified to

$$\eta\, Pc = Cd \times \frac{S}{\frac{\pi}{4} D^2 \times \text{No. Engines}}$$

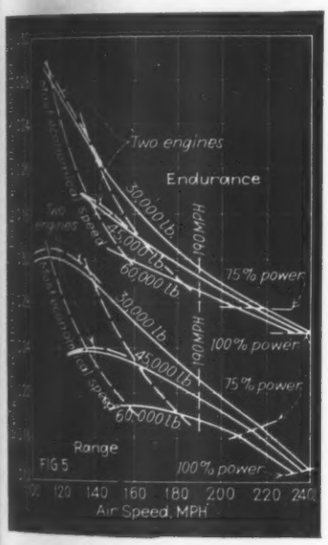
$$= Cd \times \frac{\text{Wing Area}}{\text{Total Operating Prop. Disk Area}} \qquad (5)$$

The last part of this equation is the ratio of wing area to total operating propellor disk area. The term η P_c is the propeller power disk loading coefficient. It defines the power delivered by the propeller. It is possible to plot curves of propullsive efficiency versus V/ND for constant values of η P_c. This was done for the three bladed propeller tested by Galcit and the results are plotted in Fig. 9. From equation (5) it is seen that for a constant value of Cd there is a corresponding value of η P_c and a unique variation between η and V/ND. Thus, knowing Cd and V/ND, the propulsive efficiency is readily determined. Since Cd is determined entirely by the attitude of the airplane, the efficiency is a function only of the ratio of forward speed to propeller RPM for any given

attitude and, if the airplane is flying at constant speed, altitude and weight, the η P_e curves give curves of propeller efficiency versus RPM. This gives a very direct method of obtaining the effect of RPM on propullsive efficiency.

To describe the method of using this chart for estimating range, a sample computation has been made for a typical airplane. The airplane used is a 60,000 lb., 4 engined, land transport. The engines are of 1825 cu.in. displacement geared 10 to 6. They are rated at 1000 HP at 2500 RPM at 8000 ft. The cruising rating is 2200 RPM and BMEP = 160 lb./in.². The propellers are 11.5 ft. in diameter with three blades. The airplane itself has a wing area of

(*Turn to page 71*)



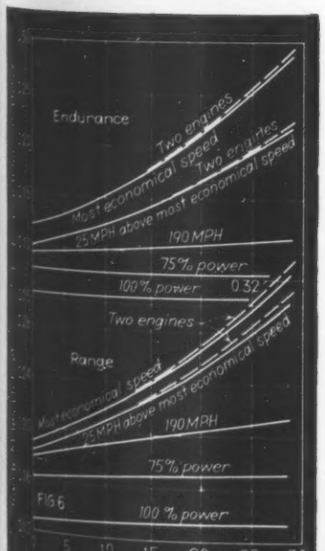


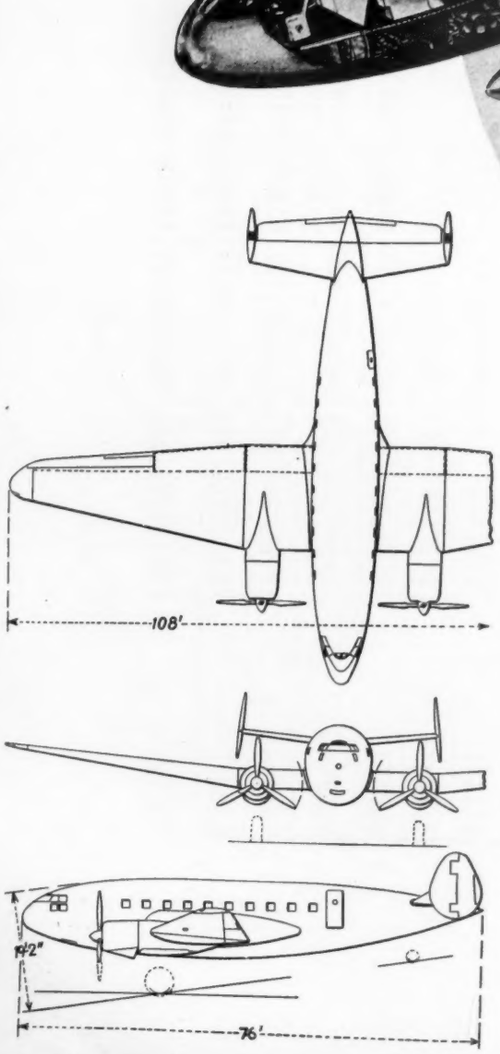
Table I
RANGE CALCULATIONS
Example Airplane—8,000 Ft.

σ=.786

Lift Coefficient	Drag Coefficient from Fig. 1	Prop. Disk Loading Coefficient = Cd x Wing area / Prop area	Propeller Advance Ratio = 88 x MPH / RPM x Diam. x Gear Ratio	Propulsive Efficiency from Fig. 9 = Thrust Horsepower / Brake Horsepower	Weight — lb.	True Air Speed—m.p.h. = $\sqrt{\frac{W}{.00256 \times S \times Cl \times \sigma}}$	Thrust Horsepower = $\frac{Cd}{Cl} \times \frac{W \times V}{375}$	Brake Horsepower = THP ÷ η (total)	Brake Horsepower per Engine = BHP / No. Engines Operating	Engine RPM = 88 x MPH / V/ND x Diam. x Gear Ratio	Brake Mean Effective Pressure = BHP/ENG x 79200 / RPM x Displacement	Specific Fuel Consumption from Fig. 2	Pounds Fuel used per Hr.=SFC x BHP	Miles per Pound Fuel = SPECIFIC RANGE = MPH/lb./Hr.
Cl	Cd	η Pe	V/ND	η	W / 1000	V_{mph}	THP	BHP	BHP / ENG.	RPM	BMEP	SFC	lb./Hr.	Mi./lb.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
.70	.0407	.196	.887	.814	60	146	1358	1670	417	2100	886.3	.493	824	.177
			.962	.81				1678	419	1935	94.0	.472	792	.184
			1.043	.79				1720	430	1780	104.8	.453	779	.187
			1.080	.77				1766	442	1725	111.1	.444	785	.186
			1.106	.75				1812	453	1685	116.6	.437	792	.184
			1.043	.79	45	127	887	1122	281	1550	78.8	.482	541	.235
			1.080	.77				1152	288	1500	83.3	.473	546	.232
			1.106	.75				1182	296	1460	87.9	.465	550	.230
			.962	.81				1094	274	1680	70.8	.506	554	.229
			1.043	.79	30	103	479	607	152	1260	52.4	.539	327	.315
			1.080	.77				623	156	1217	55.7	.526	327	.315
			1.106	.75				639	160	1190	58.4	.511	327	.315
.70	.0413	.397	.771	.72	45	127	900	1250	625	2100	129	.434	544	.234
			.736	.753				1222	611	2200	120.5	.445	544	.234
Two	Engine	s	.695	.77	30	103	486	631	315	1890	72.3	.513	324	.318
			.736	.753				644	322	1790	78.2	.494	318	.324
			.771	.72				674	337	1705	85.8	.478	322	.320
.55	.0332	.160	1.002	.819	60	165	1593	1945	486	2100	100.5	.469	913	.181
			1.102	.81				1968	492	1910	112	.448	883	.187
			1.192	.78				2040	511	1765	125.8	.431	879	.188
			1.233	.75				2120	531	1705	135	.422	893	.185
			1.002	.819	45	143	1037	1263	316	1820	75.4	.502	634	.225
			1.102	.810				1280	320	1650	84.2	.478	612	.234
			1.192	.78				1328	322	1530	94.3	.458	608	.235
			1.233	.75				1382	345	1475	101.7	.449	621	.230
			1.002	.819	30	117	565	690	172	1490	50.2	.564	390	.300
			1.102	.810				698	174	1350	56.1	.533	372	.314
			1.192	.78				725	181	1250	62.9	.504	365	.321
			1.233	.75				753	188	1210	67.5	.491	370	.316
.55	.0338	.325	.868	.710	45	143	1053	1484	742	2100	153.3	.418	621	.230
			.829	.756				1395	698	2200	137.8	.429	599	.239
Two	Engine	s	.750	.79	30	117	574	727	363	1990	79.2	.500	363	.322
			.809	.77				745	372	1845	87.7	.479	357	.328
			.829	.756				760	380	1800	91.8	.472	359	.326
.40	.0274	.132	1.177	.818	60	194	2120	2590	648	2100	134	.430	1113	.174
			1.273	.800				2650	672	1940	150.3	.417	1104	.176
			1.177	.818	45	168	1380	1687	421	1820	100.4	.460	776	.217
			1.273	.800				1724	431	1680	111.4	.443	765	.220
			1.330	.775				1780	445	1610	120	.432	772	.218
			1.362	.750				1840	460	1570	127.2	.426	784	.214
			1.177	.818	30	137	750	917	229	1490	63.9	.413	471	.291
			1.273	.800				938	234	1370	74.2	.484	454	.302
			1.330	.775				968	242	1310	80.3	.470	455	.301
			1.362	.750				1000	250	1280	84.9	.463	463	.296
.40	.0280	.269	.820	.80	30	137	765	956	478	2130	97.5	.473	452	.303
Two	Engine	s	.895	.775				988	494	1950	110	.451	446	.307
			.934	.75				1020	510	1870	118.5	.439	448	.305
.30	.0247	.119	1.172	.823	45	193	1910	2320	580	2100	120	.443	1028	.188
			1.310	.81				2360	590	1880	136	.425	1003	.192
			1.375	.79				2415	604	1790	146.5	.417	1008	.191
			1.430	.76				2510	628	1720	158.5	.412	1036	.186
			1.172	.823	30	158	1040	1262	316	1720	79.8	.488	616	.256
			1.310	.81				1283	321	1540	90.6	.464	596	.265
			1.375	.79				1316	329	1470	97.2	.453	596	.265
			1.430	.76				1368	342	1410	105.3	.442	606	.261
.372	.0266				60	200	2285							
.308	.0248					220	2840							
.260	.0238					240	3520							
.280	.0243				45	200	2087							
.231	.0234					220	2680							
.195	.0229					240	3390							
.168	.0228				30	200	1960							
.154	.0224					220	2565							
.130	.0222					240	3285							
	75%	Power		.825	60	208	2490	3000	750	2260	144	.425	1275	.163
				.825	45	214	2490	3000	750	2260	144	.425	1275	.168
				.825	30	218	2490	3000	750	2260	144	.425	1275	.171
				.825	60	233	3300	4000	1000	2500	174	.45	1800	.130
	100%	Power		.825	45	237	3300	4000	1000	2500	174	.45	1800	.132
				.825	30	240	3300	4000	1000	2500	174	.45	1800	.133

Curtiss Wright Model 20 Transport

By T. P. Wright
Director of Engineering,
Curtiss-Wright Corporation



SAFETY AND ECONOMY—on these characteristics has major emphasis been placed throughout the development of the Curtiss-Wright "20" Transport. Each design innovation suggested for consideration has had first to be proved of value in improving these qualities before its adoption could be authorized. In designing for maximum safety and low operation cost, sight has not been lost however of the need for optimum performance (which, in fact, when obtained by aerodynamic means is a component of economy); for maximum comfort; for reliability and for convenience.

Convenience implies not only suitable arrangements in the cabin but also frequency of schedule. The slogan "Every Hour on the Hour" represents a real asset to the air traveler, permitting him to take full advantage in scheduling his work and of the speed of travel which flying inherently affords. Numerous discussions with air transport operators convinced Curtiss-Wright that a plane accommodating thirty passengers, with a great degree of comfort and luxury, would be best suited, particularly between large centers of population, to make possible frequency of schedule, so desirable for the air traveler. Whereas rail transport can meet various fluctuations in traffic by additions or removals of coaches from a given train, air transport must have a service constructed around units of such size that the dual requirements of frequency of schedule and large per cent seat occupancy can be simultaneously held. However, not too small a unit can be used, as then sufficient comfort, luxury, and spaciousness can-

Charles France (left), manager of the St. Louis plant, and George Page, chief engineer, under whose supervision the details of the Model 20 have been developed. Note method of opening the pressure-sealed door.

not be offered. Once having flown in a luxurious cabin, passengers are annoyed to find it necessary to ride in a less comfortable one on a subsequent trip. The Curtiss-Wright "20", providing a cabin floor space of over 9.5 square feet per passenger in a cabin having dimensions of 6.9 ft. high by 9.75 ft. wide (at window height) by 35.3 ft. long, gives a size of such spaciousness that further increase would not provide proportionate increase in comfort and luxury, if indeed any at all.

A further point emphasized in this airplane is capacity afforded for baggage, mail and express. The 600 cu.ft. of space provided for these uses immediately indicate to anyone inspecting these compartments the thought which indeed the designers had in mind, of permitting an operator using the equipment to carry a large cargo load with his passengers, the one in no way conflicting or interfering with the other. All mail, express and baggage is located under the floor. Access to it is from the outside by means of large doors so that the compartments are readily susceptible to loading from the ground. Furthermore, all of the space mentioned is available unimpeded for payload, as a separate compartment under the wing of 75 cu.ft. is provided to house accessories such as batteries, accumulator tanks, hydraulic oil supply tanks, de-icer fluid tanks, water tanks, valves, etc.

Pressurization of the oval shaped fuselage is provided for in such a manner, structurally, as to make possible the arrangement above described without weight increase which a non-circular shape under pressure would normally dictate. The answer is the use in cross-section of two circles, intersecting in such a manner that the floor joins their points of intersection, thus acting as a tension tie to withstand loads caused by the tendency of the two circles, when under pressure, to separate. Externally, the juncture is, of course, faired so as to present a pleasing appearance as well as a clean one, aerodynamically.

In the development of the design technique of the cabin pressurization as well as in the development of items involved in equipping the plane for high altitude flying in general, the project has had the benefit of the services of Dr. John E. Younger, who gained a vast experience in this work through his active association with the pioneering efforts of the United States Army Air Corps in its high altitude development program at Wright Field. Dr. Younger is continuing as consultant on this phase of the design.

The degree of pressurization provided for structurally is such as to permit normal cruising at 20,000 ft. altitude with equivalent "cabin altitude" of 6,500 ft. Or, alternatively, 11,000 ft. cruising altitude with sea level cabin pressure.

The pictures accompanying this description show the Curtiss-Wright "20" to be a twin engined, mid-wing monoplane, of all metal, stressed skin construction. The engines used are the Wright 14 Cylinder Double Row Cyclones with take-off rating of 1,600

(*Turn to page 31*)

The cabin interior is roomy, well lighted. Amidships, two groups of four seats each swivel, can be made to face tables for luncheon or for bridge.

In the cockpit. Note center-less wheels and the compact arrangement of controls on pedestal between the seats. The automatic tell-tale can be seen in the center of the board, below the Sperry pilot.

The Birdmen's Perch

Beats all how the Perch gets around. This month we even had a couple of foreign correspondents—Cyril Mann, of London, England, and Gordon P. Smith, of New Plymouth, New Zealand. To these and all other contributors . . . *thanks!* And let's have a Whopper, a Puzzle Solution, or a nice social letter from the rest of our readers.

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

WHAT-HAPPENS-WHEN-A-BIRD ETC. DEPT.

Incomplete returns prevent our publishing the final vote on this much debated subject. But we thought you might like to know the score is awful close . . . the bird is awful dead . . . and we, too, can hardly wait till next month for the results.

THE PUZZLERS' CORNER

This month's problem is a cinch. But we warn you . . . take two looks at your answer before you mail it in to be checked. Credit for the sticker goes to Ainsley Carson of Spofford, N. H.

A clock in the offices of an oil company whose name we won't mention looks something like this:

If it takes the clock 30 seconds to strike six o'clock, how long will it take to strike twelve?

(What did we tell you? . . . it *is* easy. Send your answer to T. W. T. to be checked.)

HONOR ROLL

While we're on the subject of puzzlers, we'd like to doff our hats to the following who submitted solutions to our head-scratchers recently: W. Blake Henderson—Alfred M. Neff—Eugene Clark—Ralph J. Williams—Bob "prop wash" Dansfield—W. M. Sheffield—Amos Till—George M. Crawford—Warren C. Prosser—Henry Meredith—John R. Bell—Jack Turnquist—Bob Gleue—George B. Burger—Frank Cibino—John F. Bartel—Clarence Meshberger—Ward Gaffin—Kenneth Pitts—John Beland—John R. Krhen, and several squadrons of others who failed to give us permission to publish their names.

. . . gentlemen and scholars all!

And as they hurtled through the air
The darn thing kept on sewing—

Gulf scores a beat on all other oils with its unique Alchlor process used in refining Gulfpride—the world's finest oil for planes!

This remarkable, Gulf-owned process *—employed in addition to conventional* methods—digs down *extra* deep into the 100% Pure Pennsylvania . . . removes as much as 20% *more* motor-gumming sludge and waste!

THIS MONTH'S WHOPPER

Come, gather 'round, my hearties,
For now at last you'll see
How Mrs. Baker come to win
The yearly quilting bee.

For weeks and weeks the Gulchville calm
Was broken by the scream
Of frantic women, frantically,
'A stitchin' on the beam.

Now Bake—10 minutes left—
Was leading by a bit
When suddenly her darn machine
Broke down . . . it went and quit!

But Husband Jim, renowned in town
For bein' bright as brass,
Rushed out and grabbed a gallon of
Gulf Aviation Gas.

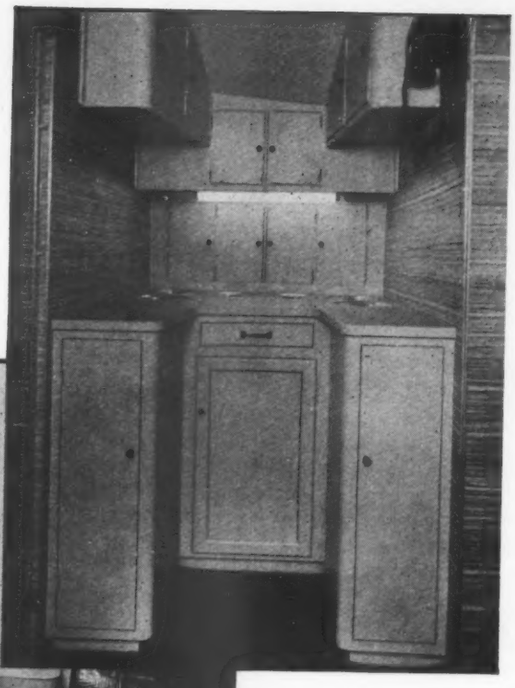
He poured some on the working parts
Then Sputter! Crackle! Boom!
And Mrs. B., machine, and quilts
Went flying from the room!

And as they hurtled through the air
The darn thing kept on sewing—
It like to made a million quilts
The way that it was going!

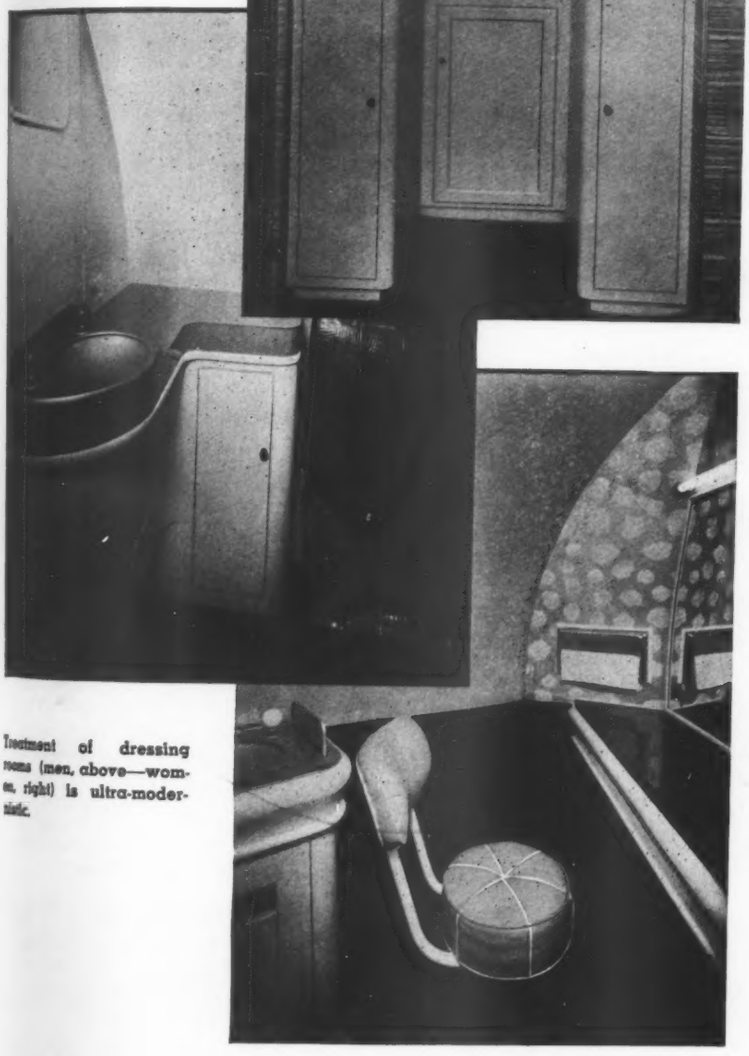
Yes . . . Mrs. B., she copped first prize.
The judges said: "How clever!"
But on *that* gas the old machine
Will turn out quilts forever! **Bob Ferry**

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**



Many a modern housewife would be glad to have as compact and convenient a kitchenette.



Treatment of dressing rooms (men, above—women, right) is ultra-modernistic.

hp. each and cruising rating of 900 hp. each. Structural and "balance" provision is made to permit the use of engines of 2,000 hp. each. The propellers are Curtiss electric, full feathering, constant speed, controllable pitch type. The design gross weight of the plane is 36,000 lb. It has a span of 108 ft., a wing chord ranging from 16.5 to 5.5 ft., and a length of 76 ft. Although originally to be presented as a 30 passenger "day" plane, it will alternatively be offered as a 20 berth "sleeper" plane.

The following table shows the important estimated performance characteristics:

Maximum Level Speed at 12,000 ft. .....237 m.p.h.
Cruising Speed at 10,000 ft....200 m.p.h.
Cruising Speed at 20,000 ft....210 m.p.h.
Ceiling—Single Engine Flight..14,800 ft.
Take-Off Distance over 50 Ft. Obstacle .....1,725 ft.
Landing Speed.....66 m.p.h.
Operating Cost—per 200 lb. unit per mile .....$.0141

The accompanying pictures also show the extent to which the designers have gone in order to insure comfort and convenience in the cabin arrangement. The mockup, described by several operators who have inspected it as the most complete ever constructed, has made it possible accurately to determine the opinions of a great number of people, of all types, of seating arrangement, chair design, wash room and powder room accommodations, lighting arrangements, interior decorations, etc. In this latter regard, the expert services of Raymond Loewy, Inc., famous stylist for many industrial projects, including the Transportation Building at the New York World's Fair, have been utilized.

Great care has been taken to reduce noise and vibration to levels lower than any yet realized in air transport. Considerable pains have also been taken to eliminate all cabin rattles and, of course, pressurization of the cabin is essentially a comfort feature.

Safety and economy, as stated at the outset, have received the greatest attention throughout the design stages of the development. A further discussion as to how this plane is designed to excel in these qualities will now be given.

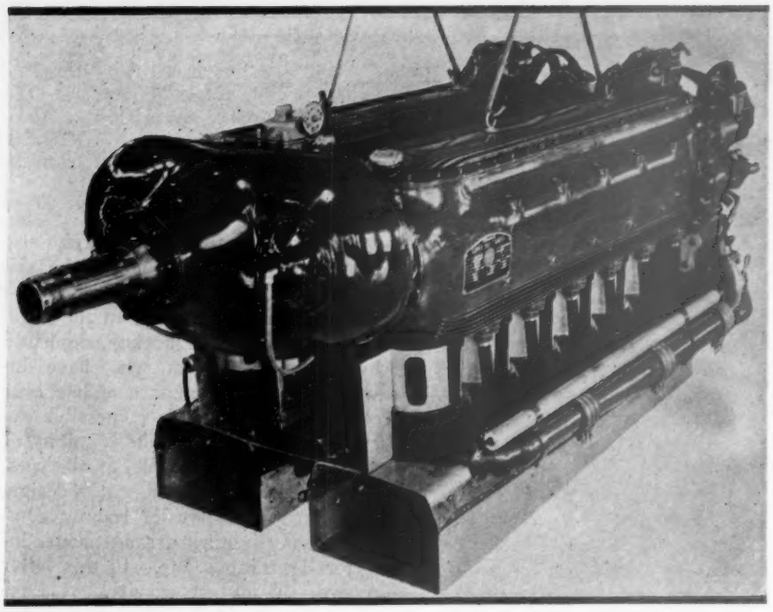
To produce an airplane of inherent safety characteristics, it is necessary to guard against qualities which an analysis of accident reports shows are the cause, directly or indirectly, of the accidents analyzed. The following statistical figures, representing the causes of aircraft accidents, averaged for 1936 and 1937, were therefore studied and, insofar as they apply to the airplane itself, steps were taken to improve conditions:

Aircraft Accident Causes 1936–7 Average

Item	%
Personnel	31
Powerplant	6
Structural—Landing Gear	19
Other	3
Weather	17
Airport and Terrain	13
Other and Doubtful	11

Particular attention to the first four items must be given as these are the ones in which the airplane itself enters in, either directly or indirectly. The last three percentages represent causes

(Turn to page 42)



Flying Equipment

Unitwin Power
Flight Tested

Power plant consists of two 260 hp. Menascos geared to a single propeller

FIRST FLIGHTS were made on June 29th with a new type powerplant developed jointly by the Lockheed Aircraft Corporation and the Menasco Manufacturing Company, and which is to be used in a new type light transport plane soon to be introduced by the Vega Airplane Company, Lockheed subsidiary. Of novel arrangement and indicating possible radical changes in design of future twin-engine aircraft, the new powerplant is dubbed Unitwin Power and consists of two Menasco C6S4 inline engines of 260 hp. each geared to a single constant speed propeller through a gear box and overriding clutches. The clutches are similar to the over-riding clutches used in automotive "free-wheeling" and provide completely automatic engagement and disengagement of the engines and propeller.

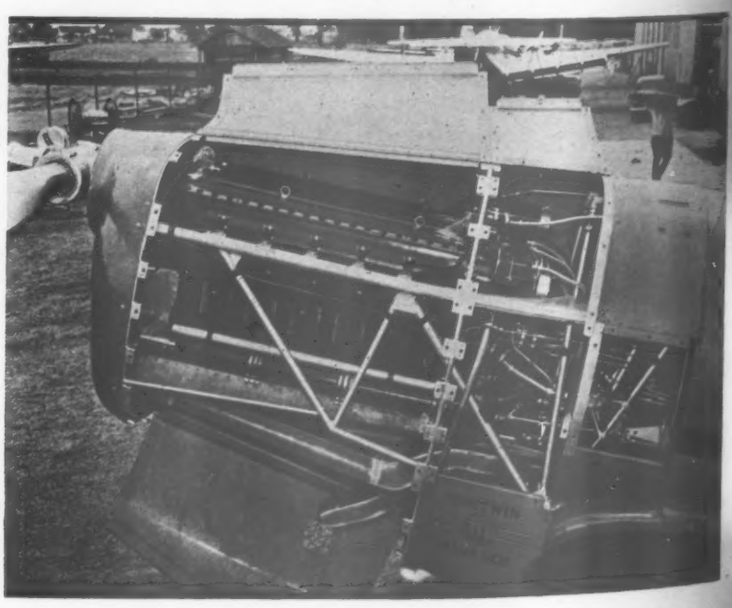
During initial flights the Unitwin powerplant was mounted in a special Lockheed Altair which has been fitted up as a flying laboratory. The Unitwin design is said to have had more than five hundred hours of block testing during the past three years. It is planned to conduct several hundred hours of flight tests with the new powerplant before it is incorporated in the final design of the commercial plane to be built by the Vega Airplane Company.

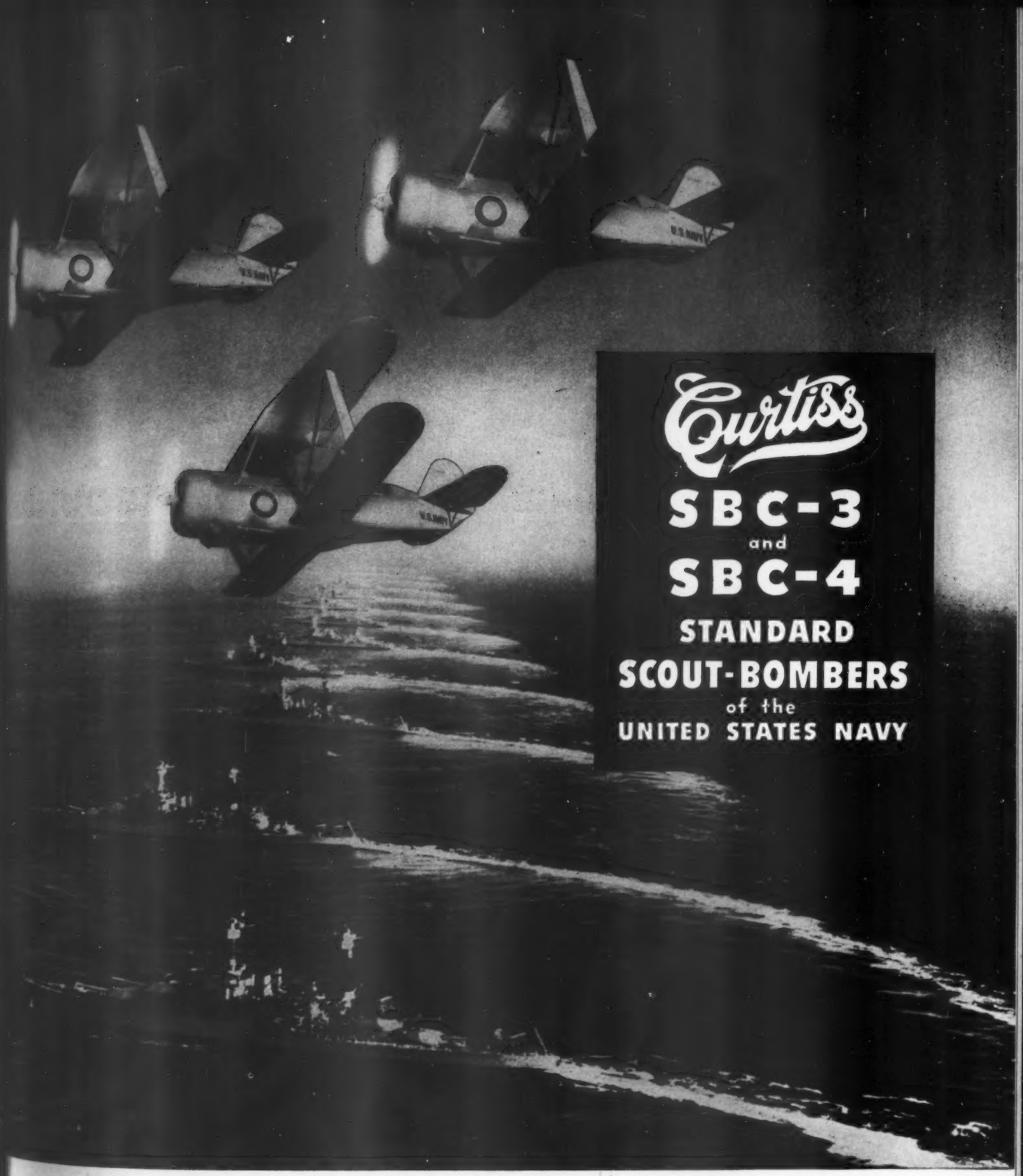
The Menasco engines used in the present Unitwin powerplant are of standard type with minor changes. Direction of rotation of the engines has been reversed in order to use a standard propeller, and manifolding of one engine has been reversed in order to provide a symmetrical installation for cooling and cowling purposes. The engines are rigidly bolted together by means of special crankcase adaptors, and are attached to a single engine mount. Each engine operates as an independent unit. At the front of the two engines a separate gear case is mounted. Each engine drives through this gear case to a single central propeller shaft. Power is transmitted through over-riding clutches in this case, so that either engine may be cut out at will without affecting the other engine. The gear case incorporates an independent lubricating system and the propeller governor is driven from the propeller shaft rather than from either engine crankshaft. Although the engines in the initial installation are mounted in the full inverted position, it is understood that the commercial version will probably Vee or "splay" the engines slightly to provide better accessibility for servicing and more room in which to retract a nose wheel in the event the powerplant is used with planes using tricycle gear.

Many advantages of the Unitwin type powerplant are obvious on casual inspection of the installation. Twin-engine reliability is obatined without sacrifice of simplicity and head resistance. Wing nacelles are eliminated. The twin-engine installation of Unitwin type is said to have slightly less

(Turn to page 35)

Unitwin Power Plant Installation in Special Lockheed Altair





The 58 Curtiss SBC-4 Scout-Bombers recently ordered by the United States Navy bring the total orders on this type up to 141 airplanes.

Designed to meet rigid tactical requirements of Navy operations, the Curtiss SBC-3 and SBC-4 types are the standard Scout-Bombing planes of the United States Navy.

Powered by Wright Cyclones, the new Curtiss SBC-4 Scout-Bombers will soon join the 83 SBC-3 type now assigned to aircraft carriers—to scout the way for the battle fleet and render their swift bombing attack.

Fighting planes of such superior design and performance as the Curtiss SBC Scout-Bombers are powerful weapons for National Defense.

CURTISS AEROPLANE DIVISION • CURTISS-WRIGHT CORPORATION

Buffalo *"The Pioneers of Aviation"* New York

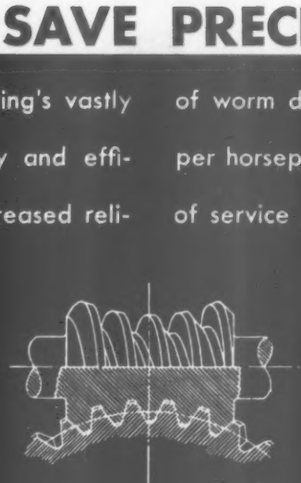
Curtiss PRECISION-BUILT ARMY AND NAVY AIRCRAFT

The New Bell 300 mph. "Airacuda" with Cone-geared aileron controls and retractable landing gear.

In the Air

CONE GEARS SAVE PRECIOUS POUNDS

For aircraft, Cone Worm Gearing's vastly greater load carrying capacity and efficiency is today contributing increased reliability and durability, with less gear weight for such parts as aileron controls, retractable landing gears, controllable pitch propellors, gun synchronizers, etc. AREA CONTACT—machined into Cone Gearing by an exclusive manufacturing process—means just that: Either smaller gears of equal load capacity—or greater capacity for the same size gears. Either way, Cone Gearing offers manufacturers of all types of worm driven equipment the lowest cost per horsepower. Impartial tests and years of service prove: Four times the A.G.M.A. mechanical, twice the A.G.M.A. thermal rating. The highest efficiencies known. Up to 30 times the instantaneous tooth contact. Ratios of 150 to one, or 1 to 6. High speed or heavy duty. No special lubricants. And Cone gears—both worms and wheels—wear *in*, not *out*. In other words both regenerate as wear occurs. In conventional worm gearing wear destroys the worm form.



Cone gearing provides area contact, i. e., line contact in section.

Conventional worms have line contact, i. e., point contact in section.

For further information on how Cone Gearing is doing a better job on all kinds of equipment, send for Bulletin No. 101-51

MICHIGAN TOOL COMPANY

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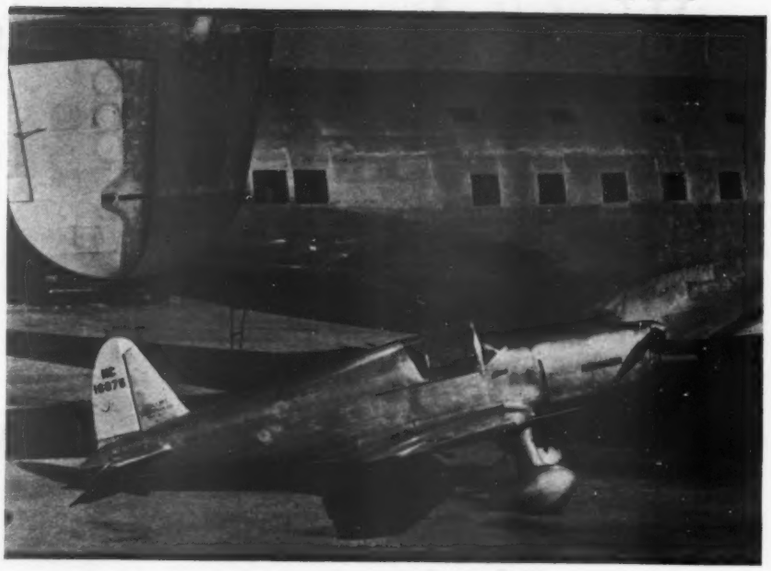
frontal area than a single radial engine of comparable total power. Plumbing, wiring, and controls are considerably simplified through mounting the two engines together. Also, there are definite structural economies through elimination of nacelle structures and duplicate engine mounts. While the present installation is strictly of a commercial nature, the military advantages of this power plant are appealing. And when one considers that this type of drive, while hardly practicable with radial engines, could surely be used with the Vee type in-line engines, it becomes apparent that a new field of development has been opened to the aircraft designer. With Fairchild Ranger engines this type installation could deliver upward of 800 hp. on a single propeller, and with the present Allison liquid cooled engines this could be jumped to 2,000 hp. per propeller. Not only does this suggest possibilities for a 2,000 hp. fighter of single engine arrangement but twin-engine reliability, but it brings to mind the Bell type fighter, with the possible future development of a super-Bell using four Allisons and two propellers to obtain a very clean machine with a total of 4,000 hp. Furthermore, the single propeller plane with Unitwin drive would be thoroughly practical for carrier-based operation with the Navy, at the same time providing twin-engine reliability for over water flying. Other military advantages of the installation are apparent, such as the possibility of firing a cannon gun through the short hollow propeller shaft.

On its test flight the Unitwin powered Altair acted quite normal, showing no apparent difference in handling from other single-engine craft. One of the peculiar advantages of this drive is that it is unnecessary to closely synchronize the two engines. Even with one engine delivering appreciably more torque than the other, the two will operate smoothly against the single propeller shaft. When either engine is engaged or disengaged there is no noticeable mechanical clash. The constant speed propeller control provides optimum propeller efficiency with either or both engines running. And if one engine cuts out suddenly the remaining engine continues to deliver its full power without the hampering effect of the dead engine and propeller, and the off-set action of the live powerplant, as in a conventional twin-engine plane with each powerplant set some distance from the center of resistance of the airplane.



The Aeroneer and the Douglas DC-4

PHILLIPS Aeroneer

Two place Metal Ship Receives Type Certificate

AN APPROVED TYPE CERTIFICATE has been granted the Phillips Aeroneer following successful completion of flight tests. This plane, built by the Phillips Aviation Co., of Los Angeles, Calif., is of all-metal construction, and was designed in an attempt to bring transport plane design to the private airplane field. The Aeroneer is a low wing cantilever monoplane seating two people side by side in an enclosed cabin. It is powered with a Menasco C4 engine of 125 hp. Top speed of 129 m.p.h. is the figure set by the manufacturer.

An interesting development of the flight tests was the method adopted to obtain wash-out effect on the outer portion of the wings which had been built originally without wash-out. As with other sharply tapered cantilever monoplanes, the Aeroneer showed a tendency to drop a wing during early flight tests, due to the effect of tip stall with consequent loss of aileron control. This was overcome by adding "bulges" to the leading edge of each wing panel along the portion forward of the ailerons. These were so designed as to change the angle of incidence of that portion of the airfoil to reduce the angle of incidence approximately three degrees, although leaving the basic wing structure unchanged. The result has been to eliminate tip stall completely and provide satisfactory aileron control even with the airplane at or near the stall. In future models 3½ degrees of wash-out will be built into each wing tip.

The Aeroneer is now being fitted with the Menasco B6 engine of 160 hp. and with slightly larger outer wing panels. Upon completion of flight tests of the more powerful model it is to be taken to Wright Field and to Randolph Field for an extensive test period to determine the desirability of using this type plane as a primary trainer.

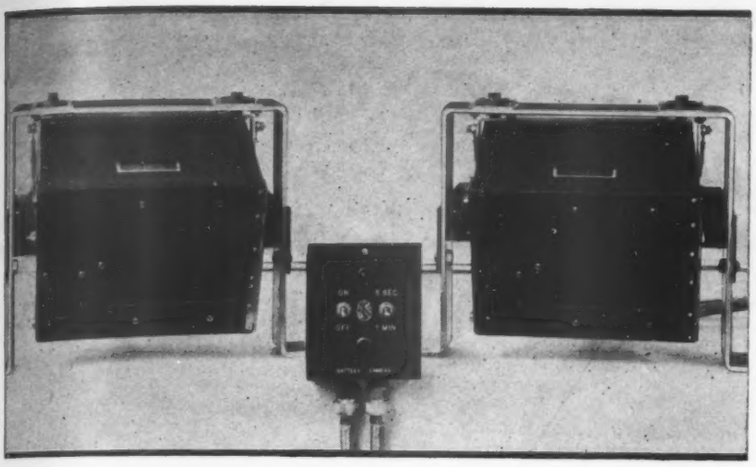
Specifications and performance figures as released by the manufacturer are:

Span	32 ft. 6 in.
Length	24 ft.
Height	7 ft. 8 in.
Total wing area	168 sq.ft.
Wing loading	13 lbs.
Power loading	17.6 lbs.
Powerplant	Menasco C4—125 h.p.
Empty weight	1505 lbs.
Gross Weight	2200 lbs.
Fuel capacity	40 gals.
Top speed	129 mph.
Cruising speed	118 mph.
Landing speed—flaps up	57 mph.
—flaps down	49 mph.
Take off run	754 ft.—full load, no wind.
Cruising range	704 miles, optimum cruising speed.
Initial climb at sea level	625 ft. per min.
Service ceiling	11,800 ft.
Absolute ceiling	14,500 ft.

World's Largest Passenger Airplane
···BOEING 314 Clipper

CENTER OF INTEREST in the forward-looking world of aviation is this latest product of the BOEING AIRCRAFT COMPANY — the giant BOEING 314 Clipper. • The enormous project of designing, building and testing this largest of all passenger airplanes, which first took to the air in June, is now entering its final stages as the big clipper is being made ready for rigorous Department of Commerce tests. • The 41-ton, 74-passenger flying ocean liner and its sister ships now under construction will fly the Atlantic and the Pacific under the famed banner of Pan American Airways.

Boeing has always built tomorrow's airplanes today!



Total weight of the Fairchild automatic log, including connecting cables of average length, approximately 30 lb. Each camera and light unit approximately 6½ in. x 7 in. x 9¼ in. Control box, 2⅞ in. x 4 in. x 5 in.

Automatic
Instrument Log

SOME EIGHT OR TEN MONTHS AGO Irving Metcalf, of the Bureau of Air Commerce, approached the Fairchild company with an idea that had developed as an extension of work started years ago with Shorty Schroeder's "man in the box". The original idea was to group certain flight instruments with a camera in a box so that they could be photographed periodically for a permanent record. Both Metcalf and Schroeder worked on the development of the idea. When Metcalf went to Fairchild he wanted some sort of photographic apparatus developed that would provide a continuous photographic record of the instruments and control positions in an airplane cockpit. For obvious reasons he specified that the apparatus should be capable of taking photographs in broad daylight and also at night without illuminating the cockpit in any manner to annoy the pilot or to affect his normal vision inside or outside the cockpit itself. He specified also that photographs should be taken at intervals of approximately one minute during normal operations and at five second intervals during emergencies. Other desirable features were such details as magazine film loading, maximum coverage in the lenses, and operation without attendance by pilots.

The Fairchild Aerial Camera Corporation at that point began a series of investigations to determine the best method to employ. Their work covered a study of illumination by means of ultra-violet rays, spark discharges of extremely short duration, and infra-red. The latter seemed to give the greatest promise, both from the standpoint of the results obtained on the film and simplicity with regard to light and source. Progress of the tests were so satisfactory to Mr. Metcalf that the Department of Commerce drew up a specification and awarded a contract for the first unit.

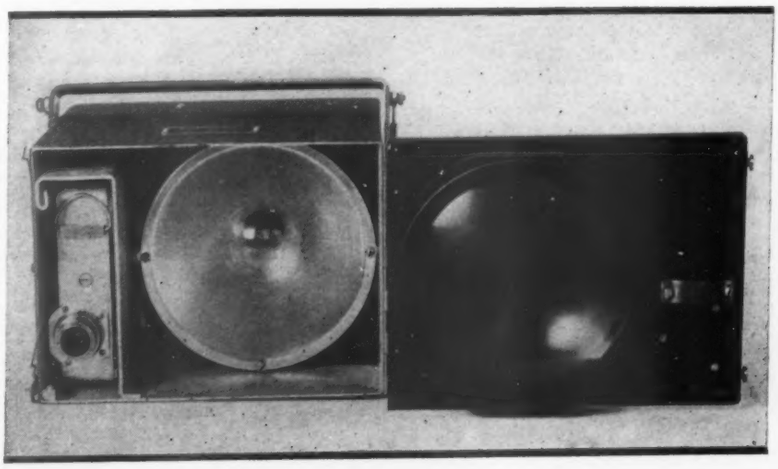
The instrument consists of three units: Two camera and light assemblies, one of which contains a timing mechanism, and a control box—all connected together and to the plane's battery by means of radio-shielded cables. The cameras are designed for suspension from brackets attached to the roof and rear wall of the cockpit. The control box may be mounted in any convenient location, preferably within the field of view of one or both of the cameras in order to record the interval at which the cameras are operating.

Each of the two cameras has its own illuminator associated with it in the same housing in such a manner that the light is at all times concentrated on the same area that is covered by the camera. A condensing lens and infra-red filter for the lamp and an infra-red filter for the camera are mounted on the cover of the unit so that the lamp and camera are easily accessible. In one of the units, a timing mechanism is located in back of the lamp reflector to control the operation of the lights and cameras. Both cameras are controlled by the same mechanism so the photographs are taken simultaneously in each. The timing mechanism lights the lamps, a half-second before tripping the cameras, so that they will reach full brilliancy before the cameras are tripped. A half-second later the lamps are extinguished. Thus the lamps remain on only one second resulting in low consumption.

Photographs may be taken at the rate of one every minute or one every five seconds, selection of the speed being by means of a toggle switch on the control box. Signal lights on the control box indicate the speed at which the units are operating—a green light indicating 1 minute operation, and a red light indicating 5 second operation. The control box also contains an "on-off" switch, and a combination fuse and thermal cut-out to protect the battery from a short circuit or continuous excessive drain.

Each camera has a remavoble camera unit containing a magazine which will hold 25 feet of film. This is sufficient for 16 hours, 40 minutes operation at 1 minute intervals, or 1 hour, 23 minutes at 5 second intervals.

One of the log units open to show light source and camera. The timing mechanism is located behind the reflector.



Aircraft Radio

New Equipment for Communication and Navigation by Don Fink

Instrument-Landing Progress

Recent Visit Reveals Important Work on Metcalf-M.I.T. System

Your editor had the pleasure several days ago of visiting the laboratories at M.I.T. where work is now under way on the Metcalf-M.I.T. system of blind-landing. A convincing demonstration of the ability of the cathode-ray indicator (see AVIATION, page 40, July issue) to respond to changes both in the attitude of the plane and in the direction of the beacon transmitter was given in a laboratory set-up. Horn projectors capable of laying down very narrow beams of waves shorter than a meter in length and a very compact receiver capable of receiving them have been shown to be practical, and are now undergoing further tests.

Awarded Contract

I.T. and T. Gets Blind-Landing Cork for Bureau of Air Commerce

ACCORDING to a recent announcement of the International Telephone and Telegraph Company, a contract for the design, manufacture, and installation of a new instrument-landing system has been awarded to the International Telephone Development Corp., an I.T. and T. subsidiary, by the Bureau of Air Commerce. Performance specifications laid down by the Department are to be met by the equipment, which will be installed on two runways at the Municipal Airport at Indianapolis. Localizer beam transmitters, mounted in trailers as well as at four fixed locations at the ends of the N.W.-S.E. and N.E.-S.W. runways are to be supplied. Four sets of marker beacons, each consisting of an outer marker two miles from the airport, and an inner marker at the edge of the field, will also be provided. The receiving equipment will be designed by the Bell Laboratories and manufactured by the Western Electric Company.

Lear Uni-hand Antenna Reel and Tuning Unit

One-Hand Reel

Learadio Antenna Easy to Operate While in Flight

A SCIENTIFICALLY DESIGNED TRAILING ANTENNA SYSTEM has recently been announced by Learadio of Roosevelt Field. The reel contains a self-acting brake which prohibits motion of the reel except when the pilot is operating it. Contact between the wire and the transmitter is maintained through a built-in phosphor-bronze brush which bears against a slip-ring within the reel. The wire leaves the fuselage through a fair-lead made of textile-bakelite tubing. As shown in the illustration, this fair-lead has two parts, one of which rides within the other. When the wire and weight are unreeled, a spring extends the fairlead and at the same time operates a switch which is connected to a warning light on the instrument panel of the ship. This light warns the pilot that the wire is unreeled, and remains lighted until the wire is fully reeled in. The weight is streamlined, has fins to prevent swinging and weaving, and is attached to the wire at a point just aft of its center of gravity. In consequence, the weight tends to dive while in flight, increasing the vertical attitude of the antenna, and thus improving the range of the transmitter. An antenna-tuning coil is available whereby the antenna may be tuned even when the wire is fully reeled in. Transmission up to 20 miles is claimed in this reeled-in position, hence it is possible to reel-in the wire some five minutes before reaching the airport for a landing.

New Compass Models

RCA Models AVR-8D and 8E With Control-Panel Changes

TWO NEW MODELS OF THE RCA AVR-8 RADIOCOMPASS have recently been made available. The models electrically are substantially the same as the older AVR-8 models. The loop is mounted in a stream-lined housing and feeds a loop unit containing two 6C6 push-pull input tubes, a 37 audio oscillator and an 84 rectifier. The receiver proper, a superheterodyne, contains ten tubes, and is mounted separately from the loop unit. The output indications may be either aural or visual, or both simultaneously.

The major changes in the new models have to do with the loop mounting and the arrangement of the tuning and band-switch controls. The loop suspension within the housing has been strengthened, and new wide-faced cut gears are used for loop rotation. Model AVR 8E has a rotatable loop, with loop-rotation, tuning and band-switching all controlled from separate remote-control panels, which may be mounted wherever convenient in the cabin. Model AVR 8D is not arranged for loop rotation, but is otherwise similar.

Style—Quality—Popularity

The Stinson Reliant

For 1938

STINSON AIRCRAFT CORPORATION

DIVISION AVIATION MANUFACTURING CORPORATION

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MEN *"in the know"*

AIRLINE PILOT

"It means safe, dependable control to me"

KNOW *Roebling Control Cord*

PILOTS, flying the larger ships at very high speeds, are especially conscious of the increasing demands on control cords. By building aircraft control cords to meet these new requirements, Roebling plays its part in the development of transport flying.

Today, pilots find that the majority of manufacturers building planes for transport service, use Roebling Aircraft Cord for controls.

Roebling Wire Aircraft Products are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel. They include: Aircraft Wire; Aircraft Strand; Aircraft Cord (6 x 7, 7 x 7, 7 x 19); Ferrules and Thimbles; Serving and Locking Wires; Control Strand and Casing; Compressed Fittings for Attachments; Power and Lighting Cable; Welding Wire.

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KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

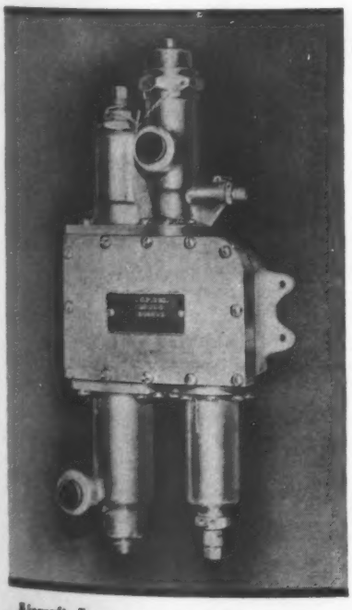
Automatic regulator

For aircraft hydraulic actuating systems

PERFECTED by the Aircraft Accessories Corporation, of Glendale, Calif., under the direction of Rodney B. Campbell, chief engineer, an automatic pressure regulator for hydraulic actuating systems on aircraft is now standard equipment on the Lockheed 14 and is being offered for general use.

Use of this pressure regulator is said to greatly simplify actuation of landing gear or flaps when hydraulically operated. In operation the pilot places the hydraulic selector valve in either the "up" or "down" position. Thereupon the gear is either extended or retracted and thereafter the pressure regulator maintains operating pressure against the system automatically, eliminating the need for special mechanical locks in the up or down positions. In operation the regulator is set to cut out at approximately 100 lb. higher than the operating pressure of the system. At this point the fluid from the pump is by-passed and permitted to flow unrestricted back into the reservoir, eliminating heating of the oil and waste of energy through the pump.

The regulator is quite compact, is proof against fluid leakage, and incorporates special hardened and ground steel surfaces for all working parts. Weight complete, without plumbing, is five pounds, four ounces.—AVIATION, *August, 1938.*



Aircraft Accessories hydraulic regulator

New position of barometric scale

Kollsman Improved

By new location of barometric scale on dial

A NEW VERSION of the Kollsman sensitive altimeter features a side-window position of the barometric scale, making it easier to read. The barometric dial numerals are placed alongside their corresponding graduations and are much larger and easier to read. The new location of the window permits continuous, unobstructed vision during adjustment regardless of the position of the adjustor's hand on the setting knob at the base of the instrument. On the altitude scale all of the numerals, including the figure 5, are used, and all are of uniform size.

Red reference pointers are also available for all Kollsman sensitive altimeters to serve as landing or cruising aids. The pointers are entirely separate from the operating mechanism of the altimeter and are set by two knobs at the center of the glass. With the pointers adjusted to show the field altitude the pilot need not remember this altitude but when landing merely brings the instrument pointers to coincidence with the red pointers. The same procedure may be used in maintaining a cruising altitude, the desired elevation being set on the red pointers and thereafter the pilot, instead of reading the altimeter, simply keeps the white and red pointers in coincidence. —AVIATION, *August, 1938.*

"Resistoflex"

Flexible tubing for oils, gasoline and organic solvents

AN INTERESTING FLEXIBLE TUBING MATERIAL, inert to gasoline, oils, and organic solvents, has been placed on the market by the Resistoflex Corporation of New York. Known as "Resistoflex" PVA tubing, the new product is available in sizes up to ½ in. inside diameter. The material of which this tubing is made is a flexible synthetic resin, polyvinyl alcohol, which is not only inert to gasoline, oils, etc., but retains its flexibility throughout a wide temperature range. This material has been used for tubing manufacture for a number of years by foreign firms with which the Resistoflex corporation is affiliated. It is claimed that this material is the only commercially available substance that is completely insoluble in gasoline, oil, the aliphatic compounds and aromatic series of hydrocarbons, ethers, esters, alcohols, ketones, etc. The material is also extremely light, with a specific gravity of 1.26, is very tough, elastic, flexible, and pressure resistant—AVIATION, *August, 1938.*

of trouble which can be rectified by the improvement of ground facilities; improvement in weather forecasting and radio communication; improvement of blind landing facilities, traffic control, and the many other things of like nature which, it is pleasing to note, are receiving so much attention currently.

How then, is the airplane itself to be improved to lessen accidents attributed to personnel, which have assigned to them such a large percentage? As shown by recent articles by medical authorities in the Air Corps, Dr. Harry G. Armstrong—*Journal of Areonautical Sciences*, March, 1938, pilot fatigue is much more prevalent than might be suspected, even by the pilot himself, and if present to any marked degree, a loss of efficiency results which diminishes ability to think clearly and act correctly and quickly, particularly in an emergency. Much stress has been laid on the same causes in connection with automobile accidents recently. Therefore, the designer's job is to make the pilot's task as easy as possible and to make his environment, his "workshop", as comfortable and convenient as it can be. Simplification of the pilot's cockpit has been strongly stressed throughout. These ends have been attained in the Curtiss-Wright "20" by the following means and design innovations:

Power booster control superimposed on the flying controls to relieve the pilot of heavy control forces, even of the degree present after resorting to aerodynamic balances. Special hookup of gyro pilot, additional to its present normal use, whereby directional control in take-off is afforded by the gyro pilot with a view to providing immediate rudder compensation in event of need for single engine flight just after take-off. Unusually good pilot vision for flying, taxying, and of the instruments, provided by large windows, small ground angle, and clear vision control wheel, respectively.

A specially designed "tell tale" instrument panel (to be described in detail in a subsequent article) which relieves the pilot of constant instrument check during a given flight regime or when changing to another regime.

Pressurized cabin and cockpit to permit flying under more favorable weather conditions, and more comfortably when at higher altitudes, in general.

Special attention to reduction in noise and elimination of vibration, accomplished in the latter case by use of dynamically suspended and vibration absorbing engine mounts. Particular attention to the incorporation of design features to decrease noise is being given under the direction of Dr. Stephen Zand of Sperry. A decibel rating of 63 is expected.

C. W. Model 20

(*Continued from page 31*)

The convenient position of the cargo door simplifies loading.

The cockpit, designed throughout by pilots, is made comfortable as to seats, access, control arrangement, and convenience.

Stability and proper coordination of controls has received attention throughout a long series of wind tunnel tests under the direction of Dr. Millikan of Cal-Tech and in collaboration with Dr. E. P. Warner, as consultant.

Most important of all, however, coming under the heading of pilot aid and, as well, general stability and control characteristics, is the provision against wing tip stall. The stalling of the wing tip with resultant loss of aileron control, existent in most tapered wing monoplanes, has been an ever-present potential cause of trouble. Knowledge of this potential danger has made necessary the avoidance of wing tip stall by so large a margin as to introduce further danger inherent in the use of higher landing speeds than would otherwise be necessary. The design expedients in the Curtiss-Wright "20" which have made possible the elimination of wing tip stall were previously introduced and thoroughly proved out in the Curtiss-Wright "19R Trainer" as well as being affirmed by the wind tunnel tests of the Model "20". The means used has been the gradual alteration in aerofoil section from root to tip, coupled with use of moderate washout of angle of attack. "The Technological Development of the Curtiss-Wright Coupe," *Journal of the Aeronautical Sciences*—June, 1936.

Much else concerning aerodynamic characteristics will have to await description in subsequent articles. Among these is the Curtiss-Wright slotted flap design to give optimum qualities for take-off and landing. Suffice it here to say that no time or expense has been spared to test out and introduce every aerodynamic innovation proved to be efficacious in improving safety.

Now let us consider powerplant arrangement. In an article appearing in the July, 1937 issue of "AVIATION", one of the Curtiss-Wright engineers, Mr. A. E. Lombard, Jr., described in detail our belief that addition of powerplants above two does not provide additional safety when considering all conditions of flight, and assuming adequate flying characteristics on one engine, a feature especially considered in this design. During cruising, and particularly over water, the four engined plane will fly on any two engines will have less likelihood of being required to land than will the twin engined plane. But, this is not the governing condition for land transport. The greater complication involved, the greater complexity in piloting, and other considerations make the case for comparative reliability during take-off not only uncertain but, if anything, favorable to the two engined plane. It should also be noted that from the statistics previously quoted, it so happens that powerplant failure which in 1927 represented 20 per cent of the causes of accidents, now shows but 6 per cent; a rapidly decreasing item. We conclude therefore that "the safety of two engined and four engined transports where operating over land, as in the United States, are essentially equal, both types offering great safety when using modern engines which have high reliability."

Another powerplant safety feature used in the Curtiss-Wright "20" is the full feathering propeller which not only enhances single engine performance but also frees the plane of vibrations likely to occur in case of engine failure when using a propeller which permits "windmilling".

From the standpoint of structural integrity, the record shows the landing gear to be the chief offender. To reduce to a minimum possibilities of landing gear failure, the designers

(*Turn to page 46*)

I know no better start for a *career* in aviation than Boeing School training

Vance Breese
(Test Pilot and Vice Pres. Bennett Aircraft Corp.)

Ground and Pilot courses at this famous school meet the industry's requirements for better trained *men—young men who can continue to take on new responsibilities*

IT'S NOT HARD to see why aviation leaders regard Boeing School graduates so highly. Can you imagine any school better qualified to prepare you than *one that's part of the air industry itself?*

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Training methods, equipment and courses here are all directly under United's supervision. Your 17 shops, laboratories and lecture rooms and the flight house — all are adjacent to the United Air Lines hangars at the 892-acre A-1-A Oakland airport.

From the day you "go to work" at Boeing School, you're *in aviation* . . . tackling practical problems in construction, flight, maintenance or operations . . . handling modern equipment . . . learning the business from experts with years in the very field you're aiming at.

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Boeing School of Aeronautics
GRADUATION and PLACEMENT RECORD
(June 1937—May 1938)

Months	*Number Graduated*	*Number Placements*	*No. Co.'s Employing Graduates*
1937			
June . . .	34	14	8
July . . .	5	7	2
Aug. . . .	4	2	2
Sept. . . .	20	17	7
Oct. . . .	4	3	2
Nov. . . .	2	2	2
Dec. . . .	29	7	3
1938			
Jan. . . .	7	14	6
Feb. . . .	1	9	7
Mar. . . .	40	16	6
Apr. . . .	6	13	3
May . . .	6	12	6
TOTAL .	158	116	25

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Check the course or courses you're most interested in:

Courses requiring high school only:
- ☐ Airline Pilot and Operations
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- ☐ Airline Operations
- ☐ Airline Mechanic
- ☐ Aircraft Sheet Metal

Courses requiring 2 yrs. pre-eng.:
- ☐ Air Transport Engineering
- ☐ Practical Aeronautical Engineering
- ☐ Airline Flight Officer

Courses for engineering graduates only:
- ☐ Airline Technician
- ☐ Dispatching and Meteorology

Courses requiring special training:
- ☐ Special Airline Pilot
- ☐ Instrument Rating

NOTE: Link Trainer Instruction available to students in all courses.

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GENTLEMEN: Please mail me—without charge—the 1938 BOEING SCHOOL BULLETIN containing complete information on the school and courses I have checked at the left.

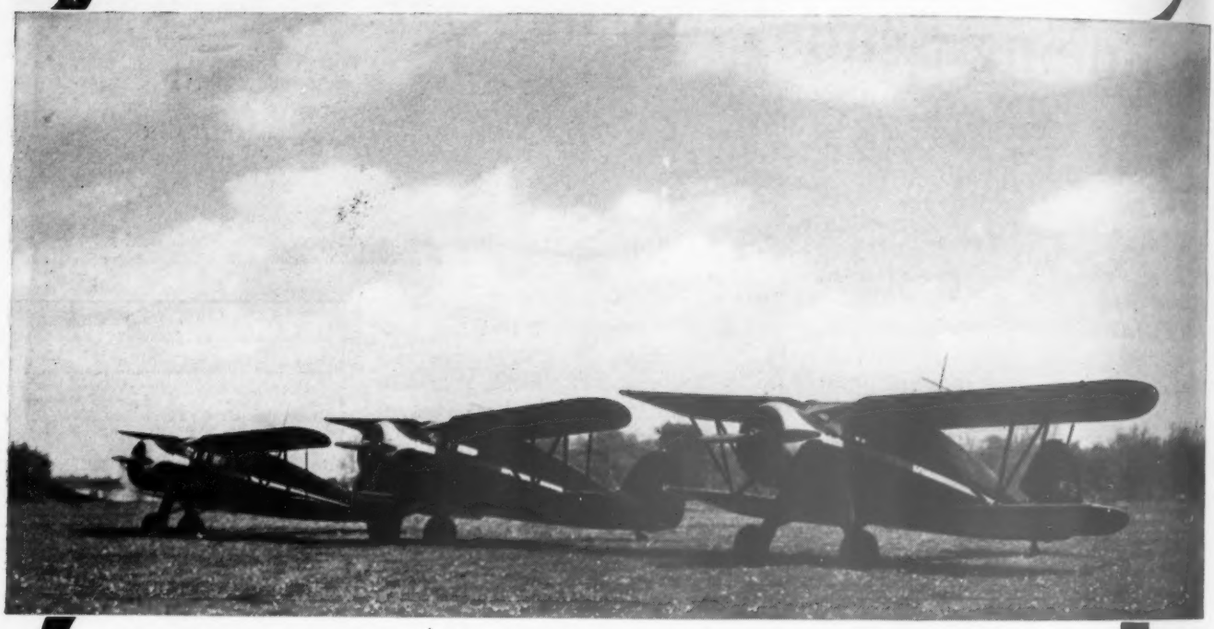
Name _____

Address _____

City _____

State _____ *Age* _____

Uncle Sam
SELECTS THE WACO MODEL S



DEPARTMENT OF COMMERCE BUYS THREE WACOS AS UTILITY SHIPS

● Three Waco 5-place Model S Cabins have just been delivered to the United States Department of Commerce. Each is equipped with two-way radio and a full complement of regular and blind flying instruments. These new ships will be used to carry representatives of the Department on airport inspection tours and other necessary flights . . .

The Waco Model S offers every essential of comfortable, swift flight—at the *lowest passenger-mile cost of any airplane!*

Low purchase price, efficient and economical flight and minimized upkeep give this Waco a unique appeal to private owners and commercial operators.

The cabin of the Model S is smartly and comfortably finished, excellently ventilated and effectively soundproofed. A hundred pounds of luggage may be carried, accessible from the cabin during flight.

Famed for its ease of control in the air, the Model S is now equipped with a wide landing gear, facilitating landing and taxiing. Write for complete information, or see your local Waco dealer. *Terms are available.*

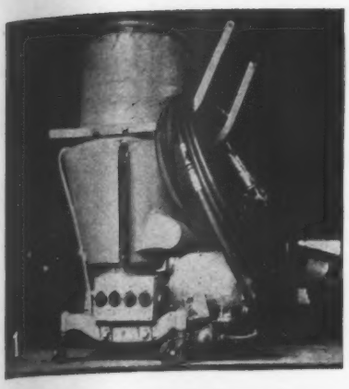
WACO MODEL N (left) . . . The new Waco "Tricycle"—the world's safest, easiest-to-fly sedan-type airplane.

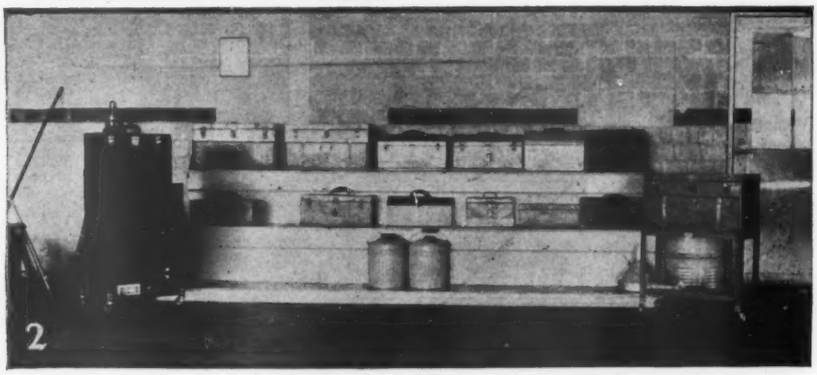
WACO MODEL C (right) . . . Faster—luxuriously comfortable for five persons.

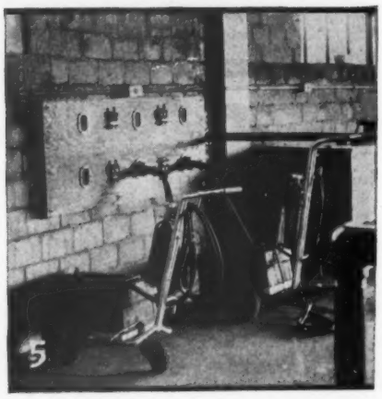
WACO AIRPLANES

"ASK ANY PILOT"

THE WACO AIRCRAFT COMPANY • TROY • OHIO







(1) Portable power grease tank, water jacketed to keep grease soft in cold weather; note four electric power outlets in base. (2) When not in use all tool boxes are kept on centrally located storage bench. Right and left are portable servicing crew tool kits, with necessary ship supplied: (3) A special lathe built for truing up and re-surfacing brake drums. (4) This pneumatic tired cart handles all the parts for one three-way controllable pitch propeller. (5) Starting battery carts plugged into panel for recharging. Note fire extinguisher mounting.

Braniff Maintenance

(Continued from page 25)

with the thought of using as few written or printed forms as possible, and putting on each as little as possible. Stunkel's attitude towards his job is well illustrated by a few of his favorite comments: "There is no authority but facts." "Nothing can supplant experience as an inspector." "The object of an inspection is to discover troubles before they develop." "Causes of failure must always be determined in order that they may be eliminated in future."

Stunkel seeks to select and train the right man for each operation, rather than to develop the right form to cover the details of the operation. And once a man is selected he is impressed with his responsibility and is given every encouragement to show initiative. Rather than seeking to rigidify his maintenance system in a complete set of complex printed forms, Stunkel seeks to keep his system flexible, as men are flexible, through greater reliance on the human element. His comment is that maintenance problems change daily and the safest and most efficient system is one that can change most rapidly and efficiently. If maintenance operations have been too rigidly compressed into a set of printed forms there is too much incentive to hold with the old method, too little allowance for a quick change to an improved method. Yet paper work and development of adequate printed forms has not been neglected. A detailed record of the life of every part, of the history of every service and maintenance operation, is kept in the Braniff shops.

Major subdivision of Braniff's maintenance organization is, quite properly, that which makes the inspection department completely independent, answerable to no one but Stunkel himself. And even if there is a question raised on an inspector's ruling it takes a board of three men to override the inspector.

Since finding the right men for the job is the sum and substance of Stunkel's method it is of interest to note that a special program has been set up to find and develop such men. This is a four-year apprentice school, qualification for which is that the applicant be 18 years of age and have at least four years of high school education. "Green" men with no previous aviation experience are preferred, and every effort is made to select boys who display character and ambition of a high type. During the first year of service the apprentice is kept in airplane overhaul work. The second year sees him in engine overhaul. And for the third and fourth years he is on line service work. At the end of the four years he is rated an "apprentice first-class," and is expected to work for a junior mechanic's rating, and eventually the rating of mechanic or higher. During this period of apprenticeship there is ample opportunity to observe the individuals and to select and encourage those who have the stuff of which Braniff workers are made. And all regular shop personnel attends formal school meetings at least once a week. At the same time he is developing his human "raw

(Turn to page 46)

material." Stunkel directs his attack, with enthusiastic cooperation from everyone, towards the improvement of mechanical facilities of all kinds.

The Braniff shops at Dallas were recently enlarged, and have been fitted with the most modern equipment available. Basis of the entire shop layout is absolute cleanliness, absolute orderliness. There is a place for everything and everything is kept in its place, and every place is kept clean. No engine or part is serviced or overhauled unless a drip pan is first placed underneath, and even then the floor is constantly scrubbed so that no spot of oil shall serve to slip-up an unwary worker.

Throughout the shop a system of parts control is used to insure definite servicing of every removable part at stated intervals, if not serviced earlier due to some imperfection noted by an inspector. As parts are removed for servicing, whether complete engines, or the smallest accessory unit, a complete record is maintained in the shop office showing location of part, reason for removal, and as it goes through the shop, then back to storage, and finally back to the plane for service, each phase of its progress, work done and inspector's o.k. is noted and maintained in the office record files. Thus the life of each part is known at all times, its condition, cost to maintain, etc.

Hydraulic servicing has been highly developed through perfection of a separate hydraulic test bench which may be used for testing landing gear, brake units, wing flaps, etc. separate from the plane. Thus the hydraulic systems can be carefully studied under exact conditions which make it possible to accurately calibrate their action. In the radio shops sets are not only re-built, but in some cases complete radio equipment has been manufactured for airline use, and a close liason has been maintained between the Braniff radio department and the radio manufacturers. The Braniff instrument shop, under the diretion of Walter Hendricks, is a model lay-out. Air conditioned and dust proofed, the shop is so lighted that it is shadowless. Every airline instrument used is overhauled complete in this shop, which was one of the first to receive full approval for servicing all Sperry gyroscopic instruments. Only exception are the clocks, which are overhauled approximately 50% by the manufacturer.

A pet project of the instrument shop, and of Walter Hendricks, has been the application of a flight level reference system by which altimeters throughout the system are kept in

Braniff Maintenance

(Continued from page 45)

calibration at all times through reference to Paulin sensitive barometers at airport control stations. One of the interesting and rather unusual problems of the Braniff maintenance departments is to work out in conjunction with the operating department a satisfactory schedule that will bring the planes into the shop for servicing at the right periods. As Braniff operates two types of equipment and flies a rather complex set of routes fanning out in four directions from Dallas, this is no easy task. A diagram of the flights made by a specific plane in order to get it back in at the approximate check periods of 11, 35, 70, 105 and 140 hour periods looks not unlike a Chinese puzzle of the highest order.

A fair summation of the Braniff maintenance system might credit it with being a live, alert, flexible system, based on individual knowledge and experience of the men who compose the organization, and depending on the initiative and enthusiasm of these men to keep the system, not only functioning satisfactorily, but moving ahead at a rate of progress at least equal to that of the manufacturers who are constantly developing new planes, engines, propellers, instruments, and other accessories. It is our guess that the Braniff system is keeping more than abreast of current developments and in any event we know from observation that they are doing what they are doing without any evidence of hurry or effort, and with enthusiasm and optimism.

Curtiss Wright Model 20 Transport

(Continued from page 42)

have incorporated an extra-length oleo stroke, permitting drop test to be withstood from a height of 42 in. (equivalent to a 900 ft. per min. rate of descent), far higher than that normally used or required. The same holds for the tail wheel. In addition, the more forward wheel location in the landing gear is such as to make nose-over with full brake application, impossible.

The structure of the wings, tail and fuselage have been decided upon only after exhaustive tests. Special studies and tests and provisions to insure against flutter have been accomplished.

Special de-icing equipment and control shapes, determined after tests in the refrigerated wind tunnel, are used. It should also be mentioned that to reduce risk of fire to a minimum, fuel tanks are located outboard of the engines, the only fuel entering the fuselage being that passing through one crossfeed line, constructed of heavy stainless steel.

Finally, it should be mentioned that the low, mid-wing arrangement was selected only after carefully considering the high wing arrangement, which was discarded because of the greater hazard involved in the event of a "belly" landing with the latter.

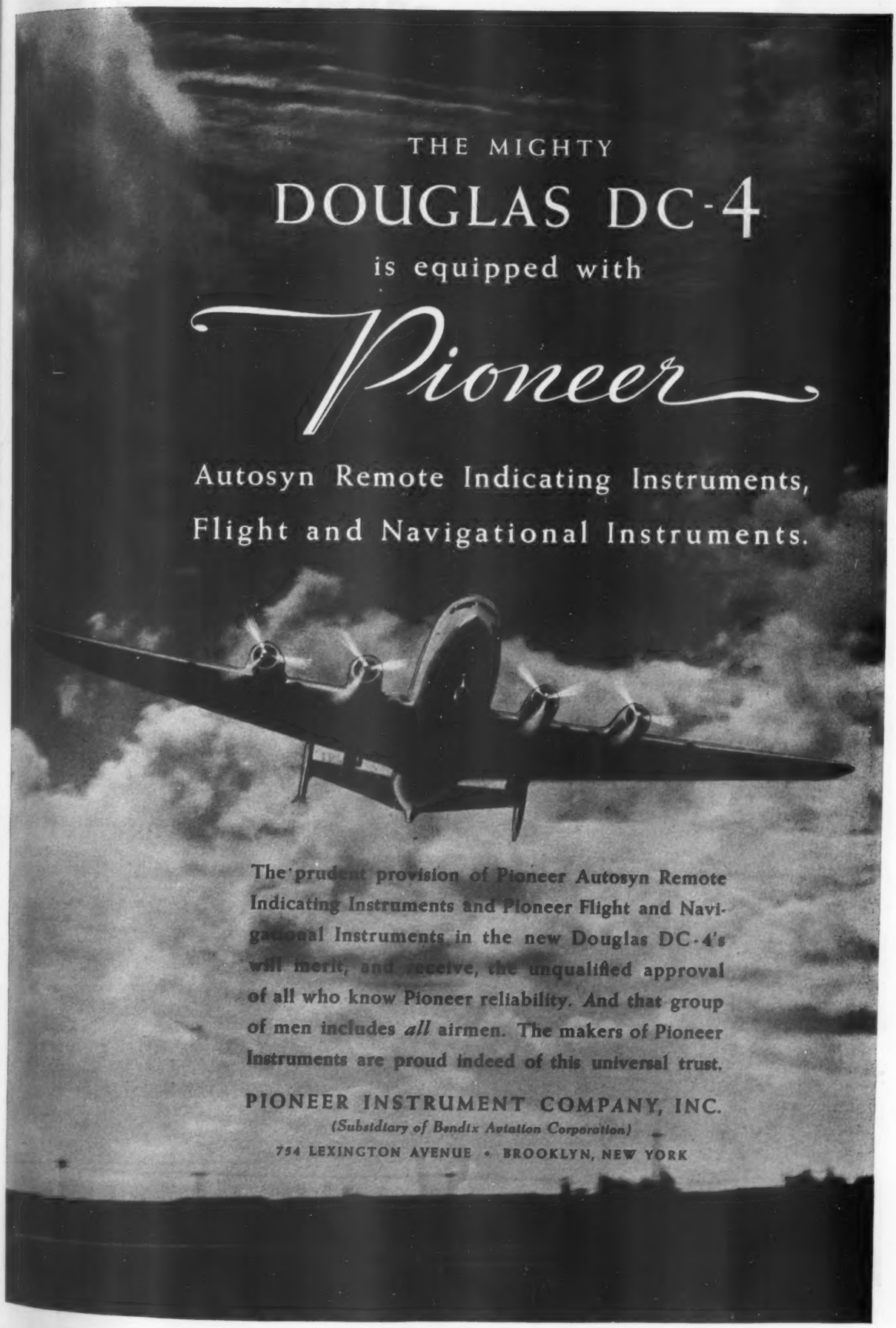
Economy, second only to safety, is built into the Curtiss-Wright "20" in many ways. These can broadly be classified under the following headings, each of which enters importantly into the accepted formula for unit operating cost:

Saving in Empty Weight—to permit larger proportion of Useful Load;
Reduction of Drag—to give Higher Speed at the Same Power;
Convenience for Operator—to directly Reduce Operating Costs.

Weight saving has been accomplished by the efficiency of the structural details selected after test, an arrangement being discovered that permits the use of higher unit stresses than heretofore. The wing covering is of the true stressed skin type, with one shear web and hat-shaped stringers, all of duralumin. The use of two large power units also contributes substantially toward producing a lighter weight empty than can be attained with four units giving equal total power.

This same factor, i.e., two powerplants, makes for decreased drag. In addition, the use of the following features contributed to reduced drag and improved economy: Substantially complete flush riveting; butt or joggle skin joints; elimination of protruding scoops for engine carburetor and oil cooler air; smooth fabric attachment on control surfaces; special low drag engine cowl (also tried out on the 19R Trainer); flush window installation; completely retracted wheels using flush, self-closing doors; thick skin to

(Turn to page 78)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DOUGLAS DC-4
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The "Charm Room" has every facility for milady's comfort.
The Main Cabin provides 40 individual lounge chairs.
Chairs make up into luxurious single or double beds.
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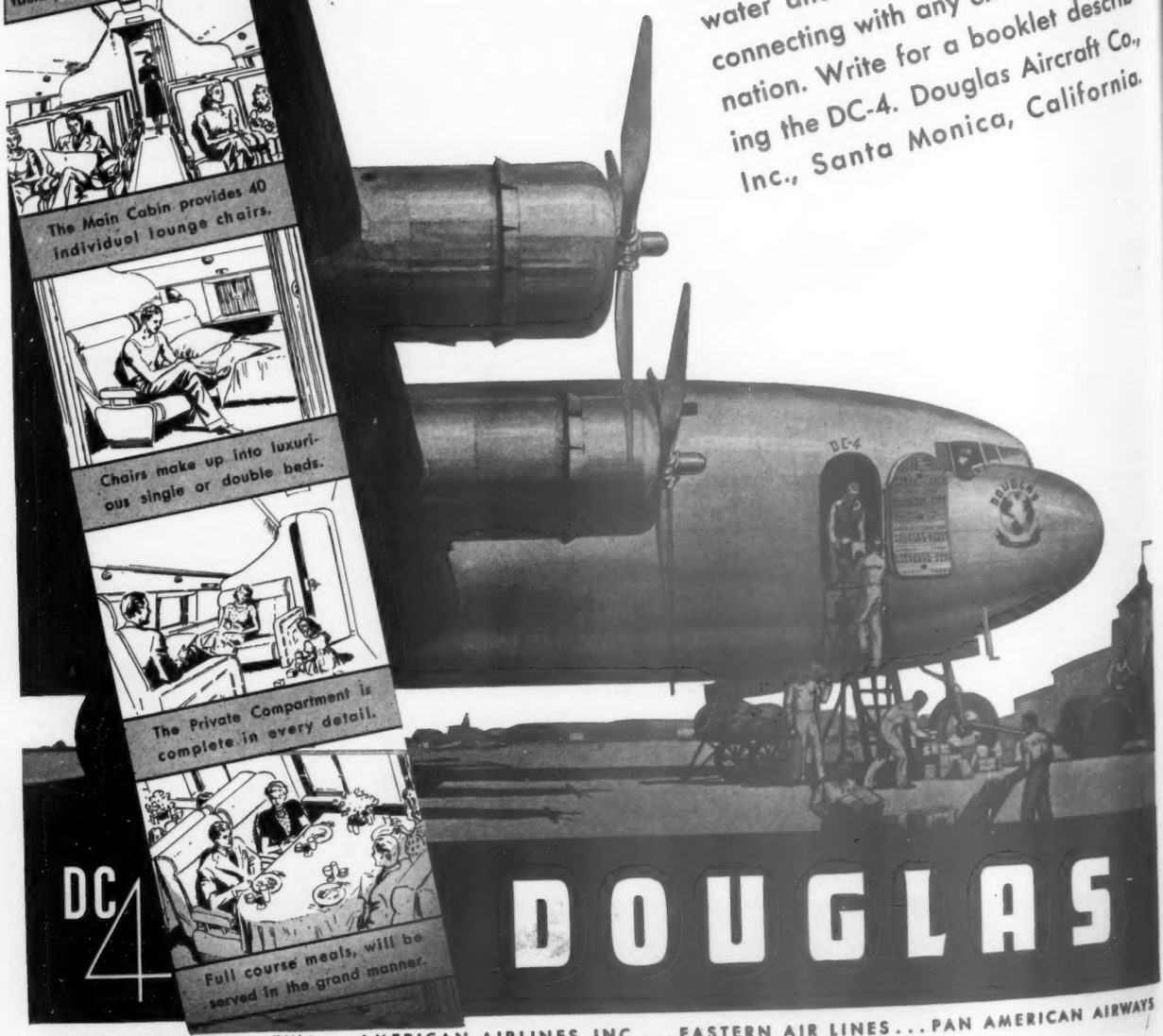
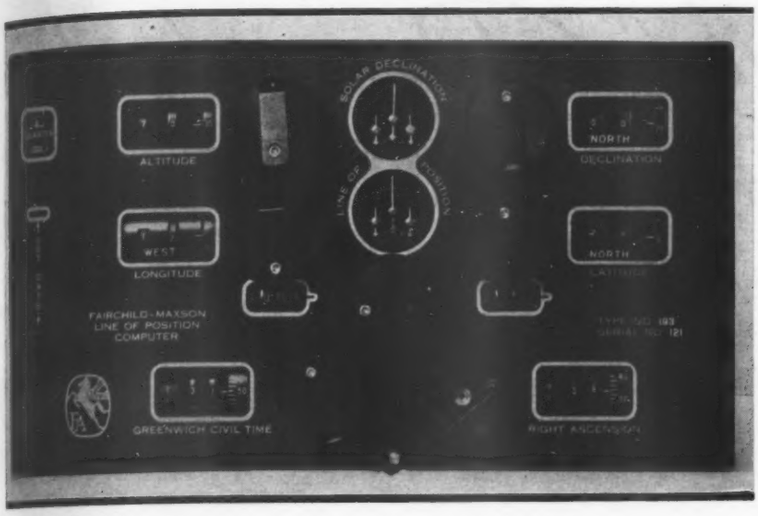
Full course meals, will be served in the grand manner.



DC 4

DOUGLAS

UNITED AIR LINES . . . TWA . . . AMERICAN AIRLINES, INC. . . . EASTERN AIR LINES . . . PAN AMERICAN AIRWAYS



Fix Calculator

The Fairchild-Maxson Line of Position Computer relieves navigators of mathematical computations

By John D. Peace, Jr.

Sales Manager and Engineer
Fairchild Aerial Camera Corporation

THE LINE OF POSITION COMPUTER used by navigators on the Hughes round the world flight is a mechanical computing device which performs the calculations required of a navigator to reduce celestial observations to a Line of Position or a Fix. The instrument was conceived and invented by Mr. W. L. Maxson, a former lieutenant in the U. S. Navy, acting as consultant to Fairchild Aerial Camera Corporation. Fairchild presented Mr. Maxson's conception to the engineers of the Material Division, U. S. Army Air Corps, Wright Field, which organization was the first to recognize the potential value of a machine of this type. A contract was placed with the Fairchild company to manufacture and deliver one machine, which was accomplished approximately two years ago. Based on the performance of this machine, subsequent orders were placed involving quantities of computers in which were to be incorporated many improvements suggested by Air Corps engineers as the result of their experience with the first machine. The machine was then redesigned for production and is now being manufactured in quantity.

Mr. Maxson, an inventor and mathematician of considerable ability, after studying the numerous methods of solution of the astronomical triangle by means of short-cut tables and mechanical devices, came to the conclusion that it was necessary to produce a device, which would, as far as the navigator himself was concerned, provide a much more simple and direct solution. He visualized an instrument having numerical dials and cranks similar to the illustration which would do away with the necessity of all arithmetical computations and also the reading of any fine scales or verniers.

The first step in the solution of a Line of Position problem involves the observation of the altitude of a heavenly body by means of a sextant and the noting of the time of the observation from chronometer, this procedure being common to all methods of celestial navigation. The navigator then sets the necessary data into the machine as here described in order to obtain his solution. Assuming that an altitude of the sun is used, the Day on which the observation is taken and the Greenwich Civil time of the observation, will be set in the machine each in its proper position. The center crank of the machine is then turned so that the drum at the left of the crank will read SUN. When this has been accomplished, Greenwich Solar Time has been entered into the computing section of the machine. The crank adjacent to the Declination counter is then turned so that the pointers of the Solar Declination synchronizer all read zero. This causes Solar Declination at the instant of observation to be fed into the computing section of the machine. Corrected sextant Altitude is then turned in on the crank adjacent to the Altitude counter until the counter indicates the corrected altitude in degrees and minutes. The machine is now ready to solve for a Line of Position in accordance with the data already entered. The solution is accomplished by determining the coordinates in latitude and longitude of two points on the line of position, which points can then be entered on the plotting sheet and the line of position laid down. To obtain these coordinates the navigator will set Latitude to an even value near his dead reckoning position. The longitude crank is then turned until the line of position synchronizer pointers all read zero, at which time the longitude dial will indicate the longitude at which the line of position intersects the even latitude as previously entered. Thus the navigator is provided with the coordinates of one point on the line of position. To obtain a second point the latitude is cranked to another reading, a half degree or full degree from the first assumption (which procedure upsets the synchronizer pointers) and then longitude cranked once again to resynchronize. This provides the coordinates of another point on the line of position. When more than one heavenly body is visible the foregoing procedure is used to determine a second line of position, the intersection of which with the first provides a Fix. Various other solutions may be accomplished on the machine by entering the various combinations of known and unknown quantities, since in every case, the machine can only be synchronized at the true solution of the spherical triangle for which some data is available.

Persons familiar with celestial navigation will recognize the solution performed by the machine as the Time Sight solution and such it is. The basic formulae, $\sin h = \sin L \sin d + \cos L \cos d \cos t$, is solved by means of trigonometric identities which per-

(Turn to page 77)

Light, Dependable FORMICA PULLEYS *for Aeroplane Controls*

FORMICA Pulleys have been used on most of the leading American aeroplanes because they are lighter than aluminum and, as they are made of material that maintains its dimensions under wide variations of temperature, are exceptionally dependable. They meet all the requirements of the Army and Navy specifications and are constantly and thoroughly tested to keep them up to that standard.

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THE AVIATION NEWS

REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

AUGUST 1938

"It Was In No Way a Stunt" Hughes

(Story on page 53)

Acme

FIVE OF A KIND: The Crew of the New York World's Fair 1939 lines up for "just one more picture" on the night of their return from the flight that put the World into the shrinking vat. Left to right: Tom Thurlow, Eddie Lund, Hughes, Dick Stoddart and Harry Connor.

Pat Terry, Newsweek

Rudy Arnold

ONE MAN GANG: Corrigan makes a last minute adjustment before the Flight to Prove that East is West. (Story on page 55)

ELMIRA ESSENTIALS: Dick duPont talks over the weather with Dr. Karl Lange before a soaring trip from Harris Hill. DuPont won third place in points, broke the American altitude record. Lange took bows for the idea that made this years Elmira Contest the best in nine years competing.

New Rules Push Soarers to New Marks in Ninth Elmira Contest

THINGS WERE DIFFERENT this year at Elmira. The Soaring Society's Ninth Annual Soaring Contest wasn't like any of its eight predecessors. For years, as we treckked up there in early July, each contest seemed to attract more ships, more pilots. Last year there were over fifty motorless planes of one type and another, each with its ground crew, pilots and near pilots. From the morning's first breeze to the last fading current out over the Chemung Valley floor, Harris Hill was in an uproar. Knocked-down ships careening up the road on trailers, ships along the fence in stages of reassembly, ships in the field waiting their turn at the winch. Crabbing along the ridge, circling slowly on the valley thermals, you'd see six, ten or a dozen others in the air at one time.

Not this year. There were only 20 ships all told and if you didn't get out there in the morning you might as well stay home for all you could see of *them*. For this meet was different because the rules were different. Where in other years almost any flight counted something in the struggle for daily points, this year the Soaring Society, egged on by its meet chairman, Dr. Karl Lange, decided to put things on a big league basis. For single seaters no flight counted unless it was longer than 32 miles; lasted over 5 hours; or reached a height of 3,280 ft. above take-off. For ships with two aboard the requirements were lower but not much. Hence the small number of planes. Hence the afternoon quiet on Harris Hill. If you didn't have a pretty darn good ship there was no use turning up. And once the meet started there was no hanging around home. To cop any prizes you had to git out and git. It may have made a dull show for the landsmen who came out to see a spectacle. But gosh what soaring it did spur the boys into!

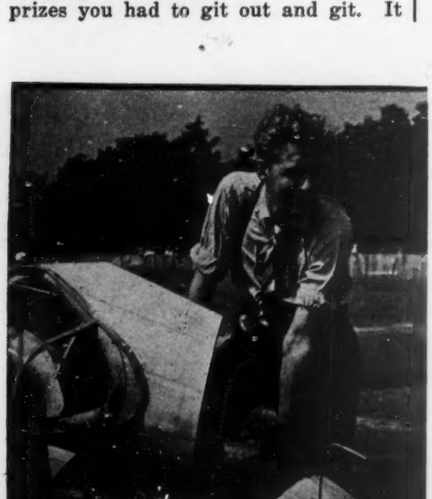
By the end of the meet, July 10: Three flights had gone over 200 miles; 24 over 100; 60 had exceeded the distance medium. Four flights bettered 6,000 ft; 20 beat 5,000; 71 had exceeded the altitude minimum. Some 33 flights topped the five hours needed for recognition on a duration basis. Even better than that, this meet really introduced the "goal flight" technique to America. Just before each contestant took off, he was asked for his "destination." If he made it, he received extra points in the daily scoring. Most spectacular of all were Riedel and Stanley's goal flights to Washington and Riedel's goal flight to Roosevelt Field, Long Island. But three flights for Harrisburg, Pa., ended there, and Syracuse, Williamsport, Towanda,

Wide World

CAPITOLIZED: Naval Cadet Robert Stanley reaches Washington.

Pat Terry, Newsweek

BABY ALBATROSS: Jack O'Meara flew this new Bowlus



Pat Terry, Newsweek

NORTH JERSEY'S BEST: Chet Decker turned in his usual excellent job; finished fourth in his Minimoa.

Pat Terry, Newsweek

TODAY'S GOAL? Peter Riedel, right, picks one from the map.

and Roundtop also got hit purposely on the nose.

Richard duPont set a new American altitude record of approx. (before calibration) 6,700 ft. Flying Cadet Robert Stanley of the Navy also exceeded the old record with a flight to 6,380 ft. Riedel and Stanley both exceeded the old American distance record by flying to Washington—Riedel 225 miles; Stanley 219 miles. Riedel and Bayer both exceeded the old American record with passenger. On the daily system of scoring, the pilot with the best distance received 100 points, the pilots of other official flights received that portion of 100 points the length of their flight was of the winning distance. Points for altitude were spread on a similar basis. In general mere duration won no points at all. Goal flights achieved counted 50 points extra. The final standing at the end of the 15 day meet was: Peter Riedel, 1,486; Emil Lehecka 1,271; Richard duPont 968; Chester Decker 870; Jack O'Meara 859; Warren Merboth 804; Alfred Bayer 804; Floyd Sweet 801; Robert Stanley 679; Stanley Corcoran 622.

Richard duPont won the Felix duPont altitude trophy and $1000. Riedel, the Bendix trophy for distance and a total of $1,500. Emil Lehecka, the Edward S. Evans trophy emblematic of the American soaring championship.

The Sailplanes

Once more the leading scorers rolled up their totals in German importations. Riedel used two Schweyer-built Kranish two seaters. Lehecka flew a Schweyer-built Rhonsperber. DuPont and Decker flew Schempp-built Goeppingen Minimoas. Yet the American designers represented had little to be ashamed of. Naval Cadet Stanley, a Cal. Tech graduate, a former Douglas engineer and at present assigned to the Lexington, turned up with a plane of his design and manufacture. With an all-dural monocoque fuselage it was one of the lightest and best-performing ships at the meet. With little previous motorless experience, Stanley proceeded to reel off flights of 144 miles; 38 miles and 122 miles. Then after a flight July 2 to the Delaware Water Gap some nitwit of a souvenir hunter proceeded to walk off with the stabilizer-rudder.

Stanley would have gone home forthwith, but the managers gave him permission to "tryout" the American built Ross, the Soaring Society had had built for experimental and official use. Small in its wooden monocoque fuselage, long in its fabric covered Gull wing, the Ross was a few pounds lighter than Stanley's own. The "tryout" turned out to be Stanley's trip to Washington, his last effort in the contest.

Neatest ship of the meet was the Bowlus "Baby Albatross" intermediate which Jack O'Meara pushed through to finish a strong fifth in the scoring. With an egg shaped nacelle of plywood, it carried its tail surfaces on a single dural boom. Its components are so simple and well worked-out, it seemed to go together by itself.

Acme

Whalen, Hughes, Lodwick

Hughes Flight Had Long Planning; Start Sets Wing-Loading Record

THIS IS NO "NEWS STORY" of Hughes' flight from Floyd Bennett Field to Floyd Bennett Field. Anyone who doesn't know the main facts about the way young Hughes and four companions last month flew round the world in half a week must be so far beyond the reach of the printed and the broadcast word that this magazine would never reach him anyway. If you would review such details as how the young men ate and what, what kind of a reception they got at Omsk and Fairbanks, and what the mayor of New York said about the business, we refer you to the files of any newspaper. If you would like a record of times and distances on each leg, you can find one in chart form on page 20.

What we have tried to do is dig out the answers to some questions not even the flood of newspaper and radio comment could furnish us. On the theory of what interests us interests our readers, we list them here.

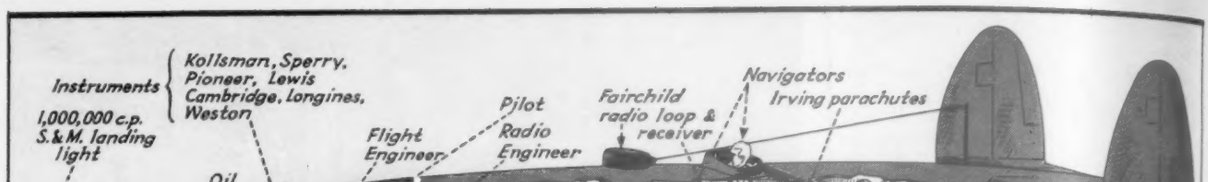
The Plan: Men who have been constantly in touch with Hughes say the project of last month's feat has been actively "in the works" for three full years. It was decided early that the best chance of avoiding serious weather difficulty over the complete circuit would occur each year in early July. The size and general character of the crew and the essential equipment for such a trip were other early decisions. The questions of governmental permissions, clearances, and requirements were obvious first steps and had been long in hand when the final decision to move ahead was made.

The actual order for the Lockheed 14 was signed last mid-October, after long conferences with what might be called the steering committee on the flight; Hughes himself, Al Lodwick, now vice president of the Aviation Manufacturing Corp., W. C. Rockefeller, Glenn Odekirk, Dick Palmer, Stan Bell, Dick Stoddard, Ed Lund and others.

Some of the special equipment Hughes already had on hand at that time. The rest of it went forward with the progress of the ship itself. Every emergency requirement the steering committee could conceive was listed as required performance of each element.

The Crew: By February Hughes had definitely decided upon the men who would go with him. Most of them were already close friends. All of them were specially fitted for the tasks they would have to perform.

Edward Lund, 32, the flight engineer, hailed originally from Calispell, Montana. Drifting to California while still in his teens, he found his first aviation job at Clover Field in Santa Monica. In following years he rose to be head of the metal work department in the Thunderbird Airplane Company. In 1929 he became shop superintendent for Timm Airplane Company, later the Pacific Airmotive Corp. He joined Hughes in time



to work on the racer which set the world's land plane record in September of 1935, and remained with Hughes until September of 1937 when he became general manager of the eastern branch of the Charles H. Babb Company. From that post he took leave of absence for the flight.

Richard Stoddard, 37, radio engineer, was the first man to receive (in 1928) a combination air transport and radio operator's license. A professional radio man since he was 14, Stoddard had put in many years operating commercial and ships' radio stations. In the late twenties he tried a career of active piloting, giving it up to take a job with NBC six years ago. He had lent Hughes aid in radio installations of former Hughes aircraft, and now undertook the development of the special radio equipment that would be needed on this flight (see p. 22).

Tom Thurlow, 33, co-navigator, graduated from Stanford University in 1928, entered the Army Air Corps that year, graduating from Kelly Field the following June. 1930 and 1931 he spent at the Air Corps Technical School at Chanute Field, later becoming instructor at the Advance Navigation Training School at Rockwell. Since July, 1936, he has been attached to the Instrument Navigation Unit at Wright Field, Dayton.

Harry Connor, 38, co-navigator, has held a master's certificate since 1925 and has a long nautical career behind him. In 1930 he was Roger Q. Williams' navigator on the first flight from New York to Bermuda. The same year he accompanied Capt. Boyd on the first Canada to England flight. In 1934 he left the sea to become associated with Edward Armstrong in the latter's seadrome project.

The Flight: The organization of the radio and weather services is described on pages 22 and 23 of this issue. By May the ship itself, with most of its equipment on board, was undergoing flight tests in California with loads up to 24,500 lbs. Arrangements had been completed for a supply of 100 octane fuel in New York, for stores of spare engine parts (still unopened) in Fairbanks, and Rockefeller and Perrine were headed to New York to help Al Lodwick with the actual arrangements at the World's Fair headquarters. By the time Hughes and his crew were ready to fly across the country with a single stop at Wichita, the weather and radio had been clicking off a world-wide weather map every 24 hours. By the time the ship took off, the weather and radio systems were working as smoothly as a long established airline network.

The flight made aeronautical history as a matter of fact the instant Hughes lifted the ship from the Floyd Bennett runway. Its gross load of 25,600 lb. gave it a wing loading of no less than 47 lb. per sq. ft., a load, incidentally, long foreseen and accepted by the technical staff. What it meant was 125 m.p.h. takeoff speed and later a 175 m.p.h. cruising in the early stages in the flight. Since this last was somewhat higher than had been foreseen, Hughes actually seems to have had some worry—not of exhausting his fuel before reaching land, but of arriving in Paris with less than the 200 gallon minimum which had been decided upon.

Outside of a radio antenna breaking at Fairbanks and again at Minneapolis, the Floyd Bennett takeoff produced the only mechanical difficulty in the whole journey. Thinking Floyd Bennett's shorter runway, (which the wind required him to use), might not be sufficient to let him get his 125 m.p.h., Hughes taxiied the ship out into the grass before beginning his run. Everyone on board felt a shock as the ship's tail wheel struck a hole, but no one considered it serious. In Paris, French mechanics found the fitting by which the wheel was fastened to the bulkhead which carried it had been broken through. The French shrugged their shoulders in despair, but Ed Lund and an American Army mechanic named Cook, providentially on the spot, pitched in and fixed things up with an emergency job using a few angle irons.

The navigating job turned out to be particularly interesting. After a brief glimpse of Boston Harbor the flyers saw nothing of the Atlantic Ocean until they had crossed Ireland. Flying high above a solid overcast of course placed a premium on celestial and radio methods, but the ship hit its calculated landfalls right on the nose, as well as the estimated landing time. Out of Paris at night and through clouds and rain

Wide World

The navigators table

until the ship came clear on top at 16,000 feet, the flyers worried seriously about the ship's lack of deicing equipment. Icing occurred then, and later, but never in bad enough form to require any change in the flight plan.

Lest We Forget

WITH ABOUT one-tenth of one per cent of the publicity output per horsepower-hour of the Hughes and Corrigan crossings, the air lines last month moved back into the Atlantic to start what seems certain to be their final pre-scheduled flying season. England's astounding Mayo composite uncoupled itself at 7 P.M. July 20, and its top component Mercury, splashed to a landing at Montreal 20 hours and 19 minutes later, delivering a half ton load. Next day it came to Port Washington, L. I. The return flight was scheduled for July 25th-28th. A second round trip is tentatively on the docket for August 15 to 21st. Early in September, Imperial's DH Albatross 4-engined land plane is scheduled to make the first of two round trips. Also listed are crossings by an improved Empire flying boat, the Cabot, some 10,000 lbs. heavier than the Short boats which made the survey flights of last year.

As we go to press, the Deutsche Lufthansa was scheduled to catapult its first demonstration flight of the season from the "Schwabenland" lying off the Azores. Thereafter one flight in each direction is scheduled for 12 consecutive weeks. Air France plans to get over here between August 15th and 20th in the resurrected Lt. de Vaisseau Paris.

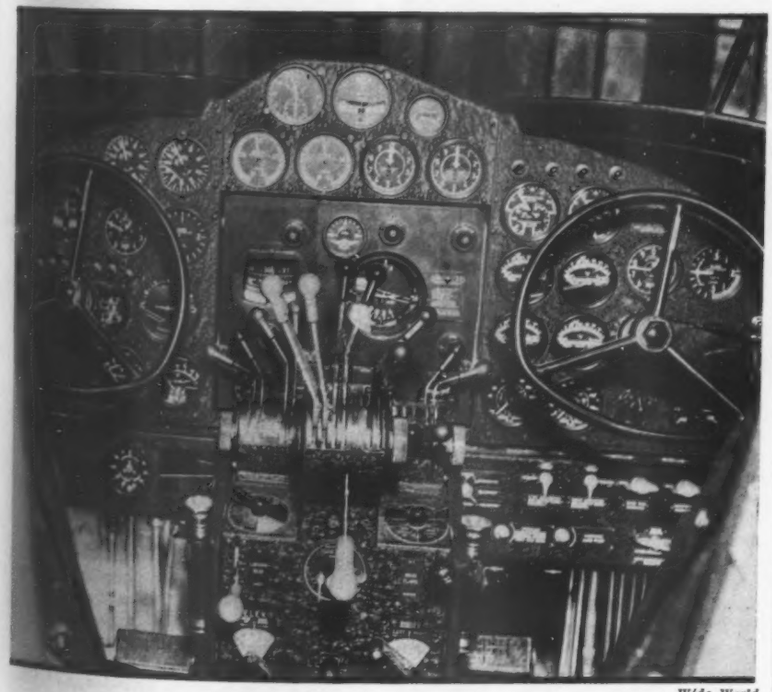
International

Ireland Astounds Corrigan; Corrigan Astounds Ireland

SUNDAY, JULY 17TH the Hughes flight seemed to be the only real aeronautical excitement the summer would afford. Twenty four hours later the aeronautical world was lapping up details of one of the weirdest adventures in its already weird enough history. One Man Gang Douglas Corrigan had taken off in his ancient Curtiss Robin, slipped across the ocean, landed in Ireland and won election in the Burlington, Wisconsin, Liar's Club with his immortal explanation that he was flying all the time toward his home port of Los Angeles, Calif. The aeronautical industry got ready to enshrine Corrigan, in the inner circle of its treasures.

Probably by design, the young mechanic's whole adventure bore a weird resemblance to the Lindbergh crossing of eleven long years ago. The Robin, if somewhat more rugged than Lindbergh's Ryan, had the same external features and overall performance of the Spirit of St. Louis. The boy's instruments,—airspeed, bank-and-turn, ordinary altimeter, inclinometer, tach, and temperature gages,—were substantially equivalent to the Colonel's set-up. The tank in the front of the cabin, blocking out all forward vision, the unheralded flight across the country, and the quiet takeoff, were also in the best lone eagle tradition. In fact the whole adventure had much of the quality of the re-performance in Boston each year of the famous ride of Paul Revere. The horse used is of the same old species, the cocked hat and knee breeches are substantially the same. All that is missing is the fact that the original ride served a real and indeed pressing purpose; the re-performance none.

As a nation turned conscious of its Irish heritage for the first time in decades stood waiting to welcome Corrigan with fame and fortune, a considerable number of stay-at-home aviators began wondering audibly about the effect Corrigan's flight may have upon the future enforcement of that fat and elegant volume of legal phraseology known as the Civil Air Regulations.



Wide World

What Hughes watched for half a week

Meet The First Civil Aeronautics

Harris & Ewing

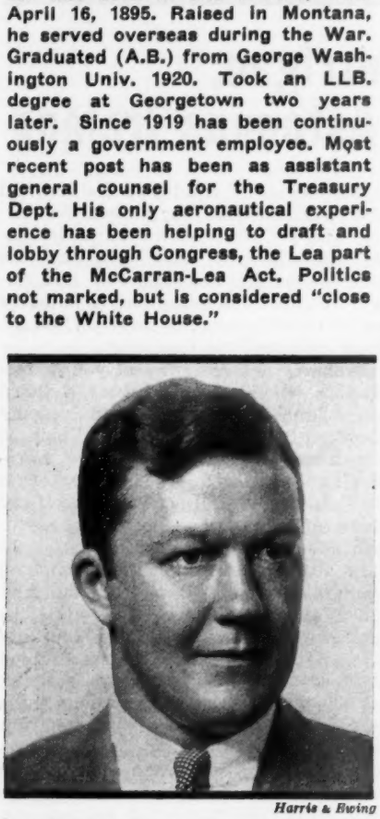
ADMINISTRATOR: Clinton M. Hester was born in Des Moines, Iowa April 16, 1895. Raised in Montana, he served overseas during the War. Graduated (A.B.) from George Washington Univ. 1920. Took an LLB. degree at Georgetown two years later. Since 1919 has been continuously a government employee. Most recent post has been as assistant general counsel for the Treasury Dept. His only aeronautical experience has been helping to draft and lobby through Congress, the Lea part of the McCarran-Lea Act. Politics not marked, but is considered "close to the White House."

Harris & Ewing

CHAIRMAN: Edward J. Noble was born at Gouverneur, N. Y. Aug. 8, 1882. He worked his way through Yale University, graduating in 1908. After some book peddling and advertising experience, he organized the candy company now known as the Life Savers Corporation, of which he was chairman of the board at the time of his appointment. An enthusiastic private owner of a cabin plane, he was one of the first to purchase an autogiro. "Interested in aviation since its inception," he lists himself as a "Liberal Republican." His term as chairman will run for two years.

Harris & Ewing

VICE CHAIRMAN: Harllee Branch was born in Polkton, N. C. Dec. 24, 1879. After a long career in newspaper work, culminating in a post as Washington correspondent, he became executive assistant to Postmaster General Jim Farley in 1933, later was made Second Assistant Postmaster General in charge of the air mail service. In connection with that work he has become familiar through first-hand contact with practically every American airline, domestic and foreign. Definitely a Democrat, he is considered one of the most capable members of the Farley staff.

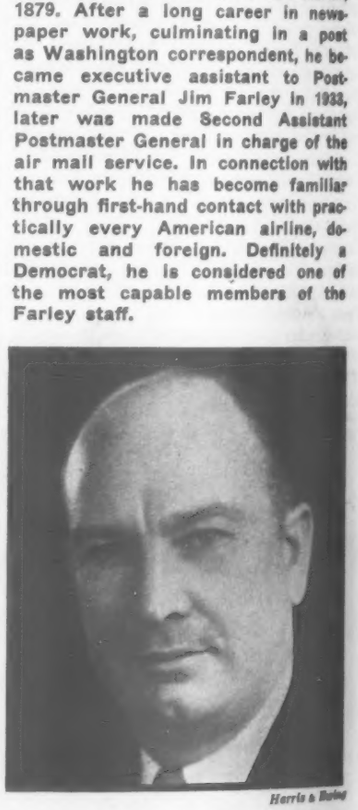


Harris & Ewing

MEMBER: George Grant Mason, Jr. was born in Mason City, Ia., Jan. 2, 1904. Raised largely in New York City, he attended Yale University. After helping organize Pan American Airways he has remained with that company ever since. Widely credited with much of Pan Am's success in the Caribbean, Mason has long resided in Havana, Cuba. His air line experience is naturally very broad and his first-hand contact with the intricacies of foreign air line development will be of prime value. His politics are "independent."

Acme

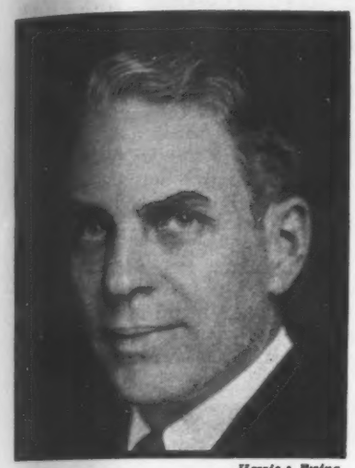
MEMBER: Robert M. Hinckley was born in Fillmore, Utah, Jan. 1, 1891. Graduated from Brigham Young University in 1916, has served as a member of the Utah State Legislature. An automobile dealer for the past 21 years, he has since 1928 held an interest in an airplane sightseeing service at Ogden and has been an avid air line traveller. Since 1931 he has been connected with relief in Utah, becoming assistant administrator for WPA for the far western states in 1934. Definitely a Democrat.



Harris & Ewing

SAFETY BOARD: Lt. Col. (Alabama N. G.) W. Sumpter Smith was born in Belle Ellen, Ala., Feb. 12, 1896. Graduating from Lehigh University with a degree in electrical engineering he served with the aviation branch of the U. S. Signal Corps during the War. After the Armistice he practiced engineering in Alabama until 1935 when he was appointed airport expert to the WPA. His connection with the development of the WPA airport program has given him a wide knowledge of the airport problem.

Authority



Harris & Ewing

MEMBER: Oswald Ryan was born at Anderson, Ind., April 11, 1888. Graduating from Butler College and Harvard Law School, he began the practice of law 25 years ago. After war service with the Army, he became an officer of the American Legion and a member of the Immigration Commission in 1923. Since 1932 he has served as general counsel to the Federal Power Commission. Listed, at least theoretically, as a Republican, he has a reputation for great sympathy with New Deal aims. His aeronautical experience, if any, has so far defied detection.

SAFETY BOARD: Thomas O. Hardin was born in Texas. A transport pilot, he joined the Texas Air Transport Company in 1927, later worked for Southern Air Transport until that line became a unit of American. Long active in the affairs of the Air Line Pilots Association, he was a member of its legislative committee for the inclusion of strong labor provisions in the Act. He is understood to have been the Association's choice for the position on the safety board required by law to be filled by an active air line pilot.

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

Jimmy's illness lets Jim name C.A.A.

That airman's dream of control—at last—by airmen pitched headlong out the window as news of the President's Authority selections came in over the teletype. Outside of Branch and Mason no one on the Authority itself has even direct knowledge of the industry, although Noble does rate as a private owner. Feeling seems to be that this Commission of non-experts can easily hire all the technical talent any time it needs any. Cynics want to know why the experts couldn't have been put on the board and the legal talent put on the hiring list.

Hardin and Smith on the Safety Board make a lot of sense to most pilots. That third position is understood to have been offered to someone who has not yet made up his mind.

Just why the Authority changed so many faces at the last minute from the gallery every one expected still is good for plenty of gossip. Jimmy Roosevelt is reported to have gone off to the hospital confident that Mason would be administrator and that the board would contain plenty of technical talent. Then, they say, they say, Farley got busy and persuaded the White House the board should have "geographical and political balance." Noble, whose reputation incidentally is that of a right guy, seems definitely a Farley idea.

Old Washingtonites are prone to laugh at the industry's naivety in expecting anything like a technically qualified board of control. Commissions just aren't made that way. In fact the old-timers point out the appointments as made are really astoundingly non-political. Chances that the Senate may upset the list when it comes up for confirmation are very small indeed. Recess appointments are very rarely tampered with and, in any case, the CAA is regarded as mighty small political potatoes—hardly worth scrapping over.

Shenanigan: Your mail to South Africa, India, Egypt, Australia—just tie it up and ship it to England for remailing under Empire first class rates. It's being done. If the Empire rate is extended to Canada, as expected, American firms, especially those with branches in the Dominion, will slip their mail over the border at a big saving. This is a violation of treaty and US-UK postal authorities are going to slap some hands.

Air mail rates to South America are too high, some export firms complain to Washington. They say a package of blueprints or specifications takes $4-5-6 postage. The PO doesn't see another rate cut ahead. They cut it to SA 32% last December. Last year postal receipts were about 50 percent of amount paid to carriers, meaning the mail to Latin America is 50 percent subsidized. PO increasingly dislikes hints that it is aiding and abetting a monopoly with subsidy. But exporters are mistaken when they say that Lufthansa and Air France mail rates to SA are lower than ours, to the U.S. disadvantage in competition against Europe. The South Atlantic mail rate is actually higher than ours; and the lines are more heavily subsidized. Exporters should remind themselves of Pan American Airways' express service which takes matter on the same planes and a rate much lower than mail, say PO officials. There is as yet no parcel air post because the PO fears the service would be swamped, requiring premature expansion.

High Airplane Performance is one of the arguments now advanced for the $3,000,000 airship the Navy will build. It will carry three to five planes designed for launch and hook-on at about 80 mph airship speed. Airplanes will be comparatively free of landing characteristics which limit performance of surface-carrier airplanes. If this objective proves out, the Navy will go ahead toward a 10,000,000 cubic-foot bag to carry some 18 fighting airplanes which might attain a speed of 400 mph enough to catch the latest bombers—a feat that would save the services no little embarrassment. Then too, such a dirigible could carry eight bombers; seven could carry 56—a surface carrier load. Airship advocates believe they could range planes twice as far as surface carriers. Important question: Are seven dirigible carriers less or more vulnerable than one surface carrier? There is a feeling in Washington that lighter-than-air is on trial for its life, what with Dr. Eckener's project in jeopardy for lack of helium. But nobody seems ready to count the dirigible out as yet.

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

Prestige routes keep Europe's transport in deep red

Statistical shenanigans are in order now that Air France and Deutsche Lufthansa have finally come out with their reports for 1937. Comparison with U. S. lines isn't so easy, for the same types of figures aren't always given, but with a little imagination and a sliderule a few things show up. . . . First is that to get anywhere you have to break each line down into its European and World sections. When you do this you find Air France flew about 4,900,000 miles in Europe and around 1,700,000 outside. Lufthansa's corresponding figures are 11,600,000 and 2,600,000, giving her credit for her affiliates Condor in South America and Eurasia in China. For a scale, U. S. domestic miles were 66,000,000, and foreign 10,900,000. . . . About the only common denominator in the figures available is the mileage flown, but when we get everyone down to a per thousand-miles-flown basis, we find Lufthansa carried 24 passengers on European runs, Air France 18, and the Average Domestic U. S. Line 17. This looks pretty reasonable, for Lufthansa has a lot of short lines inside Germany that would build up her standing. For Air France we can figure an average frequency running about one and a half trips a day, against around five and a half in the U. S. Load factors run around the U. S. average—Lufthansa's was 54% for 1937 and right now on the London-Paris run Air France is batting about 70% and getting way over her usual share because of faster service. When you look at the World routes a big difference shows up from U. S. foreign lines in passengers carried per mile flown. Lufthansa carries about half as many as Pan American and Air France about a tenth. . . . Add it all up and you see why Lufthansa draws 41% and Air France 57% of its income as subsidy.

The airline map of Europe looks about the way the U. S. would if each operator decided he had to run to everywhere everyone else does. The lines have got together pretty well on spacing schedules and avoiding rate wars, but the old prestige story means that traffic on any one route is cut between from two to four lines and nobody makes an honest living by intensive hauling. It's helped to keep everyone on their toes as far as equipment and service go, but it's been hard on the governmental pocketbooks. . . . Now the same setup is being repeated in running air routes over the world, with the U. S. out for her share too.

South American feeders are a prize example of the prestige-expansion itch. British and Italian missions have been tripping over each other in Argentina, Brazil and Uruguay looking for rights to run feeders for their projected ocean runs. . . . Lufthansa's affiliate Condor has grown to a pretty respectable line with 14,600 route miles, including a short-cut across the continent from Brazil to Peru. Lufthansa's own ships run across from Argentina to Chile, along with Pan American and Air France. . . . Air France, the original Old Settler in those parts, is speeding up its services with new equipment to get ready for passenger traffic across the South Atlantic this fall.

Imperial's new full-time chairman is Sir John Reith, and her Empire mail scheme is now extended to Australia, Quantas having replaced its landplanes from Singapore on with Empire boats. Around the end of the year the Australia-New Zealand run should get under way with some of the hopped-up Empire boats designed for temporary North Atlantic work.

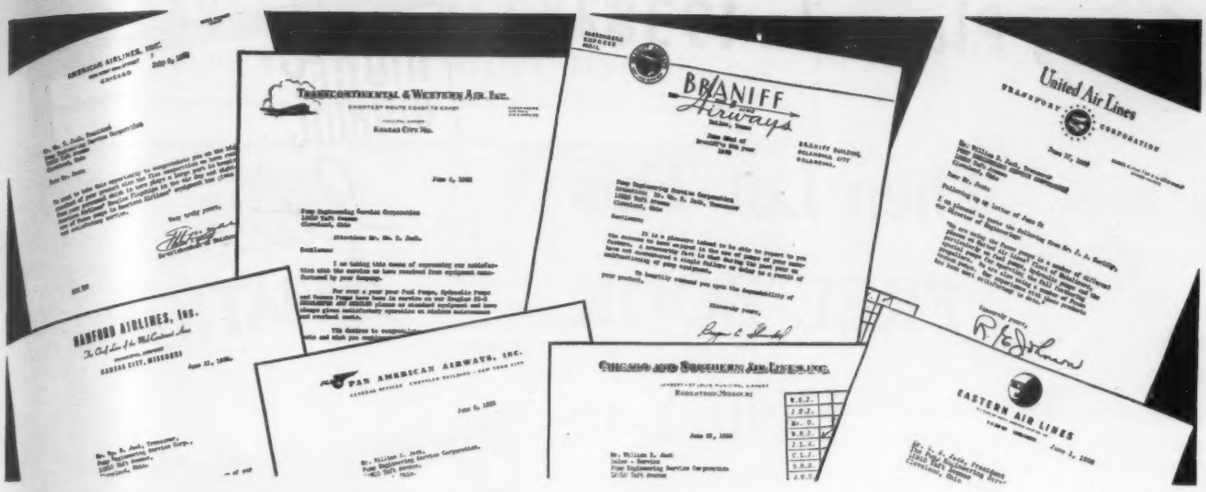
Glide control is what the English call the flap rigging on the Miles Monarch, a small cabin job for the private owner. The split trailing edge flaps are vacuum operated from a reservoir hooked to the intake manifold, and controlled by a lever alongside the throttle. The catch is that the flap setting is proportional to the lever movement, and gadgetry is put in to make it as foolproof as possible. When the flap lever gets to the setting for maximum lift (around 15 degrees down) it runs into a stop, so the pilot won't go through this to the maximum drag position at 90-degrees-down without knowing what he's up to. To take care of the boys who might be coming in with flaps full down and forget to pull them up if they have to go around again, there's an interlock with the throttle lever that kicks the flaps to maximum lift position when the throttle is opened.

Iron men and wooden ships are demanded by a lot of Frenchmen as remedies for slow military production. The Air Minister says by next year 200 or so a month will be rolling off the line, against about 40 a month for the year to date, but the wood enthusiasts say this could be stepped up considerably. The metal boys claim wood isn't suited for modern high performance ships, that France is a big producer of light alloys, and that in wartime everyone from auto body to dishpan makers could turn to making airplanes. The wood side comes back with the high properties of woods impregnated with plastics, the fact that a few well-placed bombs on electric power stations would leave aluminum smelters high and dry, and the final blast that it's always easier to find whittlers than tin-knockers. . . . It does look as if wood's in for a comeback, at least as far as training and army cooperation ships go. The new Hanriot twin-engined general purpose prototype is wood except for the spars. . . . Even the English may chop a few ancestral oaks—the big orders for trainers timed to take the curse off the American purchases will take a lot of cords. The twin-engined Airspeed Oxford has wooden spars, plywood stressed wing skin, and mixed fuselage. The Miles-Kestrel is designed with wood wings and either wood or metal fuselage, but it looks as if the all-wood version is the one that will be turned out most.

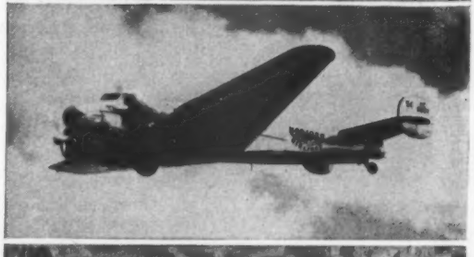
Low frontal area is one of the chief claims to fame of the new 525 H.P. (takeoff) De Haviland Gipsy Twelve engine. The Britsh are pretty proud of its fitting inside a symmetrical cowling with an area of 6.4 square feet (which isn't very far from the area per hp. of recent radials). The trick cooling system makes a clean looking installation in a wing nacelle. It's an air cooled inverted V, air being taken in the leading edge of the wing on each side at about three quarters propeller radius and carried forward over the cylinders inducts. It finally goes out through a flap in the belly of the cowling. Taking in the air out there isn't supposed to hurt the wing any, and gives plenty of cooling during takeoff and climb.

Too low frontal area is what a French engineer says is the trouble with French radial engines. He produces a lot of figures to show that while in the U. S. they were satisfied to boost up outputs and keep outside dimensions about the same, the French went and tried to make the engines smaller the more they boosted them, winding up in a lot of trouble. This may have something to do with the amount of time they're spending on trick cowlings for radials.

The Wind of the Century was the name hung by the Japanese on the special long range monoplane that recently set a new closed-course distance mark of 7,249 miles, giving them their first big-league record. It's supposed to be designed by an aeronautical brain trust from Tokyo Imperial University—but when the news hit France the Dewoitine works let off the Howl of the Century. The French story is that the chief engineer of the works that built the ship was employed by Dewoitine when they were building the D-33 that Doret and LeBrix almost flew to Japan and back in 1931. When the Japanese wanted a crack at returning a record flight, Dewoitine obliged them with drawings, which according to him looked mighty like the Wind of the Century. An aeronautical grudge fight may come out of it, since Dewoitine is said to have underway a ship grossing around 25 tons with a range of 11,000 miles.



"On Schedule" with PESCO EQUIPMENT



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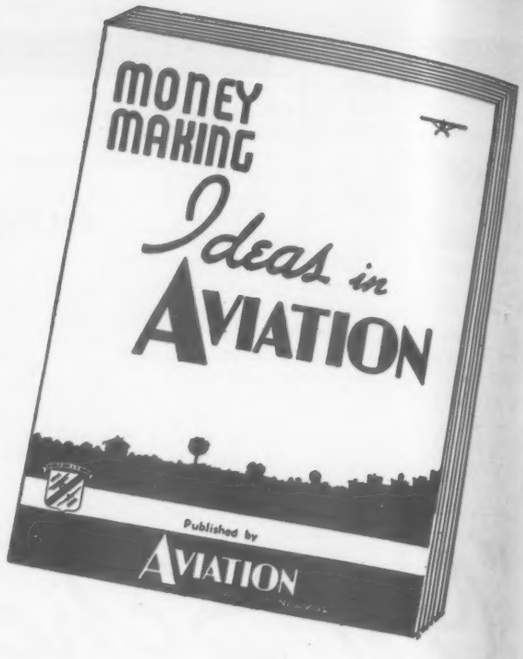

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AVIATION PEOPLE

Who's Who in This Month's News

PRESIDENT OF THE YEAR: Robert E. Gross of the Lockheed Aircraft Corp. Since assuming that post early in 1935, he has watched his company grow from a minor element in the American industry to one of first importance. Now Hughes' flight has done for the Lockheed-14 what the MacRobertson Race did for the DC-2.

Wide World

MEDALIST: James H. (Jimmy) Doolittle receives the Spirit of St. Louis medal for contributions "to the advancement of aviation" from Dr. Harvey W. Davis, president of the A. S. M. E.

PLANT MGR.: Don Carrol who has stepped into that position at Vultee, has behind him a nine year record—two at Spartan, three at Boeing (where he pioneered new drop-hammering), four at Vultee.

MISSIONER: Michel Detroyat, who has shown our stunters and racers a thing or two, is visiting us with a French Mission, come to study American production.

CHAMPION: Comm. Charles E. Rosendahl, U.S.N. America's leading fighter for airships, visited Friedrichshaven last month on the centennial of Zeppelin's birth. He is slated for sea duty.

Harry H. Wetzel

THE AVIATION WORLD lost an irreplacable asset with the death from peritonitis July 5th of Harry H. Wetzel, senior vice president, and general manager of the Douglas Aircraft Company.

Only fifty years of age at the time of his death, Harry Wetzel passed at the very zenith of a meteoric career. Born in Tamaqua, Pennsylvania, Sept. 18, 1888, he graduated in 1914 from Penn State University with a B.S. degree in industrial engineering. In July, 1916, he became assistant to the Chief of Aircraft Production, United States Signal Corps, and was assigned to inspection duty at the Curtiss Airplane Company, then went to Boston to take charge of all inspection of aircraft materials. At the outbreak of the war he was called to Washington for production duty. In February, 1918, he left the service to take a direct part in the manufacture of training planes. In 1921, after a brief career in the heavy metals industries, he joined Donald Douglas as general manager of the newly formed Douglas Aircraft Company. Since that time Harry Wetzel has guided the Douglas destinies through a period of growth and change such as few industries have witnessed. He supervised work on the original Douglas "Cloudsters," on the DT series torpedo planes for the U.S. Navy, and in 1924 on the "Round-the-World" cruisers. Thereafter the Douglas Company has built nearly 1900 planes: mail planes, transports, torpedo and bombing planes, patrol boats, observation planes, amphibians—and through it all the genius and energy of Harry Wetzel played a large and leading part. He had a major hand in bringing the DC-2, the DC-3, and the DC-4 into being. Today's huge Douglas plant, with more than a million square feet of shops and more than eight thousand workers, is a child of his rearing. His touch has been felt wherever aircraft have touched the lives of men.

He was an Industrial Member of the Institute of the Aeronautical Sciences, and president of the California Air Industries Association.

LET'S TALK BUSINESS

The Air Corps went on a spree on its fiscal New Year's Eve, June 30th. In one last big splurge of contract-placing, it brought its funds-committed during the fiscal year of 1938 up to some $42,500,000. Among the $14,433,196 worth of orders placed June 30 (and why wait to the last day to do 33 per cent of your shopping?) were:

Douglas Aircraft—$5,703,287 for 78 additional B-18A bombers and $766,591 for changes in existing aircraft.

Boeing Aircraft—$3,174,802 for 13 additional B-17B bombers.

Vultee Division of Aviation Mfg. Corp.—$297,180 for seven attack planes.

Wright Aeronautical—$922,860 for 108 engines.

Allison Engineering—$987,891 for 40 engines.

Pratt & Whitney—$662,534 for 128 engines.

Curtiss-Wright—$155,076 for propeller control mechanisms.

Hamilton-Standard — $144,600 for propeller control mechanisms.

Shell Petroleum—$99,999 for aircraft fuel.

Eclipse Aviation—$224,770 for power plant accessories.

Lycoming got off to a flying start in marketing its new 4-cylinder 50 hp. unit for light planes. R. E. Palmer and George Brew recently loaded three of them into the baggage compartment of a Stinson. Taking off from the Williamsport, Pa., airport at half-past-eleven one morning, they delivered one each at Piper (Lockhaven, Pa.), Aeronca (Cincinnati, Ohio) and Taylor-Young (Alliance, Ohio), finishing their trip by 4 P.M.

General Electric's News Bureau tells of three patents recently granted G. E.'s Nicholaas Meijer. All deal with mechanisms to adjust prop pitch by varying the temperature of an element in the hub mechanism—heat being supplied by electric coils or exhaust gases. Does this mean G.E. will enter the prop field?

Grumman Aircraft Engineering has received Navy contracts for an additional lot of 27 single-seater shipboard fighters of a model previously delivered and for one experimental single-seater of advanced performance. The combined orders add $845,000 of business to Grumman books, bringing the backlog to $3,750,000.

United Aircraft has reabsorbed its subsidiary United Aircraft Exports. Tom Hamilton, former Exports president (and Hamilton-Standard founder), has become European representative for United Aircraft. Reed Miller has been named a United Aircraft vice-president and general manager of the new export division.

New aviation investment companies have been rarer than triplanes for, lo, these eight or nine years. But now with aeronautical shares leading the whole market out of the Valley of Despair,

Five Months Production Beats 1937 by 49 Per Cent

	—This Year—		—Last Year—		Value Ratio
	Units	Value	Units	Value	1938 to 1937
Military Planes	589	24,192,282	198	9,963,391	2.43
Mil. Plane Spares		4,638,669		3,216,389	1.36
Military Engines	963	6,991,691	817	6,017,596	1.16
Mil. Engine Spares		1,968,979		1,531,144	1.28
Total Military		37,791,621		20,728,521	1.83
Civil Planes (singled-engined)	687	1,431,918	682	2,090,668	.69
Civil Planes (multi-engined)	76	6,041,876	88	6,173,720	.98
Civ. Plane Spares		4,970,036		2,710,177	1.83
Civil Engines	1,537	6,099,830	1,546	6,160,369	.97
Civ. Engine Spares		2,438,118		1,650,633	..
Total Civil		21,081,778		18,785,567	1.12
Total Mil. and Civil		58,773,399		39,514,087	1.49

Exports (including chutes and accessories) for the five months' period totaled $29,168,727—113 per cent ahead of last year's first five months' figure. Production data by the Aeronautical Chamber of Commerce. Export figures from the Department of Commerce.

CHANCE·VOUGHT·AIRCRAFT

One of the four divisions of United Aircraft Corporation

EAST HARTFORD CONNECTICUT

things are different. Item: the announcement of a public offering of 300,000 shares in a firm to be known as Aeronautical Securities, Inc. Officers are Minton Warren (once head of American Moth); A. Pendleton Taliaferro, Jr.; Col. Henry Breckenridge; Charles R. Stevenson; Frank A. Vanderlip, Jr.

The 1,100 hp. Wright Series G-100 Cyclone, after more than a year's use by domestic air lines, has been released for export. Simultaneous release was made of the Chandler-Groves carburetor and the Wright two-speed supercharger.

Statistic: Fafnir engineers report that —exclusive of engines and propellers— each B-17 "Flying Fortress" contains 1,169 Fafnir bearings; each Bell "Airacuda" 664.

PROFITS AND LOSSES

» BREWSTER AERONAUTICAL CORPORATION, for the six months ending June 30, 1938, a net profit of $210,397, equal to 60.1 cents a share on 350,000 shares of outstanding common stock of $1 par. Compares with net loss of $45,299 for the period from Feb. 10, 1937, to June 30, 1937. Second quarter profits were $117,034, against a loss of $38,666 for the same period in 1937. Unfilled orders totaled $2,165,405 on June 30, 1938, against $1,630,585 at June 30, 1937. On June 20, 1938 a dividend of 10 cents a share was declared payable August 10th.

» DOUGLAS AIRCRAFT COMPANY, for six months ending May 31, 1938, a net profit of $1,093,149, equal to $1.91 a share on 570,683 shares of capital stock. Compares with a net profit of $525,822, equal to 92 cents a share for same period last year. For quarter ending May 31, 1938, an indicated net profit of $686,378 after deduction of $291,741 for experimental charges on the DC-4. Compares with revised net profit of $288,471 in same quarter last year, and $406,771 in quarter ending Feb. 28, 1938. All bank loans, amounting to $5,230,000 last Nov. 30 have now been liquidated, and inventories reduced to $9,881,775. Net sales for first six months amounted to $16,643,242. Net sales in second quarter were 50 per cent greater than during preceding three months, and 91 per cent more than for the second quarter of 1937. Current backlog of $26,545,652 compares with $26,800,000 on May 31, 1937.

» NORTH AMERICAN AVIATION, INC., for three months ending March 31, 1938, consolidated net profit of $212,084, compares with net profit of $69,051 for same period in 1937. Unfilled orders of Engineering and Manufacturing Division at March 31, 1938, amounted to $10,296,363 as compared with $6,013,556 for March 31, 1937.

LOGGING THE LINES

Air Transport Drift Sights

by DAN SAYRE

That new Authority faces some tough ones

Well, one Era of Wonderful Nonsense is over. And the history of air transport under the Air Mail Act of 1934 closed on as crazy a note as any of the cancellation hysteria that brought that act into being. We might refer to it conveniently as the Second Battle of the Alamo. The trouble all started when the Post Office, rushing (for some reason known only to itself) to set up a lot of new mileage before the C.A.A. took over, advertised for "competitive" bids on an air mail route from Houston, Texas, to San Antonio and from Houston to Brownsville. Now that was a very dangerous thing to do down in a country where they will pay Billy Rose a thousand bucks a day just to keep a neighboring town in its place. Especially since the new route, in the part from Houston to Brownsville offered whoever should get it a direct connection between Pan American's Mexican routes and Eastern's service to the South and East. Eastern wanted it—naturally. With such a connection it could route its passengers straight through to Pan American's waiting Douglases. Braniff wanted it—just as naturally. Up till now its been in a position to deliver just about one hundred per cent of the Mexico-bound business east of the Rockies to the border. Well, June 18 the bids were solemnly opened in Washington, though anyone could have promised they wouldn't call for enough revenue to pay for return postage. Sure enough Braniff's bid called for the sum of $.00001907378 per mile—there's imagination for you. But Eastern got below that. It bid absolutely zero cents per mile. Of course, both knew that as soon as the C.A.A. opened shop they could howl for higher pay and undoubtedly get it. But now only Braniff raised its voice in loud protest. It was, Braniff alleged, illegal for the government to accept gratuitous services. Solemnly the Post Office submitted the matter to its Solicitor, W. C. O'Brien. Solemnly July 7, that gentleman ruled that a zero bid was, too, "acceptable". Five days later, though, reason broke at least into the picture and the whole affair was left on the C.A.A. doorstep.

Just whattinhell the C.A.A. is going to do about it, I'm sure I don't know. But its going to be a lot of fun to stick around and watch. What in fact is the C.A.A. going to do about all these ten-cents-a-year bids which have already been accepted. Logically under the new law, the commission will go deeply into all mail rates; arrive at some good fair figure—graduated by class of route or equipment perhaps and based on either mileage or pound mileage or some combination of performance factors—then proceed to apply it equally to *all* airlines alike. Even if the low-low bidders did get their routes with the express provision they must carry on at those rates for three years, there's nothing in the present law that makes them an exception. Yet what a good moral squawk the unsuccessful bidders for those routes have coming to them!

And here's another thing to watch: Which line (Eastern or Braniff) deserves the nod on this particular route for one of the new commission's bright new certificates of Public Convenience and Necessity? Both are first rate air lines. Both have a sort of "eminent domain" in the region in question. Both have plenty of capital behind them. Which to choose?

Just to complete the list of things they've gotta decide (besides the mere trifles of rates for passengers, mail and express). What about the United-Western Air proposal to interchange sleeper planes on a leasing basis, a la railroad? What about the Atlantic and American Export's ambitions thereon? What about consolidations between lines? Is the policy going to be to follow the old 1934 Act pattern or will mergers be generally encouraged? What's going to be the policy about "winter educational" fare cuts and all-expense tours? What's going to be the policy in deciding on minor routes between the big, established companies and the small but deserving newcomer?

Log Entries: Put Chicago & Southern down as a member of the select group of air lines qualifying in the dividend-paying class. July 5, Carleton Putnam, president, announced a dividend, payable on holdings of June 22, of 52.5 cents per share of the company's outstanding convertible preference stock. Added to an earlier melon-slicing that brought C & S dividends to date to 70 cents per share . . . C & S also announces the return of Amos Culbert (from his position as Executive Assist-

And That's That

THE WHITE HOUSE
WASHINGTON

TO THE HEADS OF THE EXECUTIVE DEPARTMENTS, ESTABLISHMENTS, AND AGENCIES:

The Standardized Government Travel Regulations permit travel by air lines when the cost thereof, less the amount of salary and subsistence allowance that would be saved by this more expeditious method of travel, does not exceed the cost of the usual railroad or steamer transportation.

Paragraph C of Section 204 of the Act of June 23, 1938, creating a Civil Aeronautics Authority, permits travel by commercial aircraft, when authorized by competent authority, without regard to the cost of such transportation as compared with the cost of other modes of transportation.

In order to hold to a minimum the cost of air travel that would be in excess of such cost under the existing Standardized Government Travel Regulations, it is my desire that all requests for travel authority of this character be given the closest scrutiny and that such travel be permitted only upon the written authorization of the head of the department, establishment, or agency for which the travel is to be performed.

(Signed) Franklin D. Roosevelt

July 5, 1938.

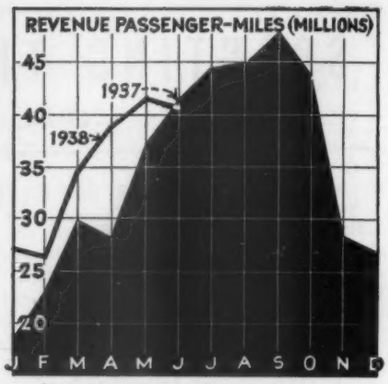
ant to Jack Frye of TWA) to become Vice President, Secretary-Treasurer and General Counsel. . . . To finish with the "Valley Level Route," C & S offered wives-free, children-in-arms free, and kids-up-to-fifteen half-fare as a family vacation lure good until Aug. 1 . . . A few days earlier American, United, TWA, Northwest and C & S had announced a permanent slash in rates for children from two-to-twelve to half fare; no charge for infants in arms as formerly . . . Boston and Maine—Central Vermont Airways is booming this year. Paul Collins, president, announces that for the first five months of 1938, passenger-miles are up 57 per cent to 679,210. May was 104.9 per cent better than May 1937 . . . United has dedicated and moved into its plush new office building at the Chicago Municipal Airport. United's new summer schedules provide 35 per cent more seats than last year's. Mainliners will hereafter fly directly between North Platte and Denver when their schedules call for stops at the latter city, now that United has finished work on the airway between those two points. One more United item: it now has in operation a simultaneous two-way Telemeter wire service from coast-to-coast. Radio will be restricted to messages relating solely to aircraft in flight . . . The ICC ended its air line career with a release to the effect that the airlines last year issued passes for $3,885,933 compared with $2,851,550 in 1936. Company employees rode $1,828,060 worth; their families $817,044; government officials $120,547. The other million was used up, I guess, just by us plain dead heads . . . Western Air Express reports 935,000 passenger miles for June, a 35 per cent gain over May. Alvin Adams, president, attributed much of the increase to recent opening of daily schedules to Glacier and Yellowstone National Parks and to fare-and-one-quarter rates for round-trip vacation flights . . . Northwest suffered a passenger fatality and the loss of a Lockheed-14 in a crash at Billings July 8. The take-off with five passengers, pilot and co-pilot was apparently normal. Then, press accounts say, the ship stalled at 1,000 ft. and spun in. We'll hold our opinion for the official report.—A. L. Neimeyer, Dept. of Commerce inspector, was among those on board who climbed out unhurt . . . Plans for New York's Union Airways Terminal at 42nd St. and Park Ave. have reached the application-for-a-building-permit stage. Architects estimate the completed three-story building should be ready for the opening of the World's Fair next spring . . . American Airlines has presented ten-year pins to ten pilots who have been flying that long for that system—a remarkable record. The pilots are: C. F. Pedley, H. J. Rader, R. J. Rentz, H. B. Russell, J. W. Johannpeter, B. A. Carpenter, W. P. McFail, B. W. Robinson, J. F. Westover and R. Fortuner . . .

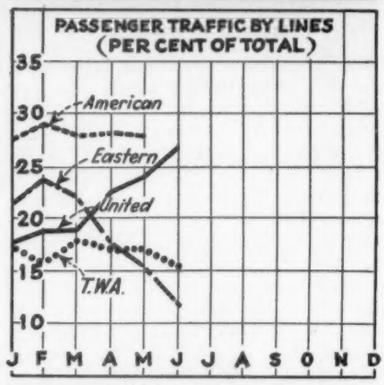
We got a lot of reactions to those "box scores" of ours in last month's issue. Strangely, several young enthusiasts for some air line or other thought we had gone out of our way to insult their particular version of the World's Greatest Air Line. Just why a mere rearrangement of widely published governmental figures should have drawn such a reaction is beyond us. The young men in question seemed to think, moreover, that such data weren't any of the public's business. As a matter of fact—if ICC procedure with the railroads is any precedent—by the time the C.A.A. gets settled down to work, hitherto confidential air line figures of many kinds are going to be about as private as a cat in a gold fish bowl.

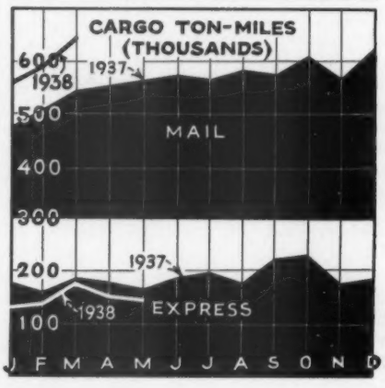
Just to harden the young men against such a day, we offer a hitherto unpublished set of figures which most air line traffic heads watch from month to month like a pilot hawks an instrument panel. It is nothing more spectacular than the Chicago ticket office's report on how the boys are doing out of Chicago. For some of the lines listed it, of course, means a lot more than it does for others.

Per Cent of Seats Utilized Out of Chicago by Airlines

	January	February	March	April	May	June
American Airlines	51.05	70.03	68.43	67.03	69.46	51.71
Braniff Airways	33.18	42.97	52.71	46.9	47.53	32.03
Chicago & Southern Airlines	47.63	54.05	65.33	80.1	79.79	60.08
Eastern Air Lines	56.01	66.57	67.02	70.1	67.32	59.06
Northwest Airlines	84.67	93.53	68.62	84.8	68.96	62.89
Transcontinental & Western Airlines	51.10	72.10	77.10	53.4	49.55	41.17
United Air Lines	51.42	76.74	73.98	63.7	64.37	56.93







AIR TRANSPORT INDICATOR

July 1, 1938

97.6

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during June 1938, to the corresponding figure for June, 1937.

For the first time in six months the Indicator stands at under 100. First six months totals: 1937 — 174,900,000; 1938—209,200,000, up 19.6 per cent.

SCOUTING THE SQUADRONS

Notes and Comment on our Air Defenses

England doubles our biggest air budget

Congress hasn't been so liberal since the Armistice. Almost $124,000,000, some 28 per cent of all Army funds, will be spent on the Army Air Corps during the fiscal year starting July 1, 1938. Excluding most of the cost of building, operating and maintaining carriers, the Navy's aviation bill for the same period will hit $110,000,000.

With that kind of dough in prospect, the War Department—by its own lights—is going to town in a big way. First it emptied its pockets June 30 of all the money it had left from its last year's allowance, $14,433,196.88 (see page 62). Among the other things it crossed off its shopping list in that splurge were orders to bring the total number of Boeing B-17 bombers on-hand-or-order up to 52. It also upped its on-hand-or-order Douglas B-18's to some 250. This brought airplane orders for fiscal 1938 up to 588 units costing a total of $29,000,000 divided as follows: Pursuit 236; Bombardment 118; Attack 35; Observation 33; Primary Trainers 20; Cargo 51; Basic Combat 95. In addition the War Department laid out during that period some $6,000,000 for 732 aeronautical engines and about $7,500,000 for aeronautical instruments and accessories of one type or another.

The method of scoring by which the Corps measures its progress toward its authorized strength of 2,320 "serviceable" planes is no simple thing. The appropriations for this fiscal year provide for contracts for 394 planes for the Regular Army, 48 for the National Guard and 32 for the Organized Reserves. Adding these to such current classifications as "project planes on hand (about 1250); project planes on order (about 1125) and non project planes on hand, obsolete but usable (some 475)"—and you come out with a total of about 3,300 aircraft.

Then you throw away the obsolete classifications (or better yet put them in some sort of reserve storage) and make allowances for some more obsolescence and the usual washouts and you come out with an agreement with the Air Corps estimate that it will just about reach its authorized strength by July 1, 1940—the date assumed for delivery of all aircraft ordered by June 30, 1939. After this last date all procurement will therefor be entirely for replacement only unless, and one will get you five it will be, the "authorized strength" has by that time been increased.

The Navy is in the same boat. For some years the Bureau of Aeronautics was shooting for an objective of 1,910 "useful" planes. Under funds available for this fiscal year, the expectation is for 1,879 such aircraft to be on-hand-or-order by July, 1939. Recently, however, the Navy figures it should have 2,050 planes by 1941 for the old Treaty-strength Navy. To top that off, the Naval Expansion Act now permits the naval air force to be increased up to 3,000 units. Whether funds will be forthcoming by the time new ships and carriers are ready to take such an increase depends on Congress' state of mind next year and the next and the next. However, the general consensus of official opinion seems to be that our naval aviation must stay tops and that when the time comes so will the money.

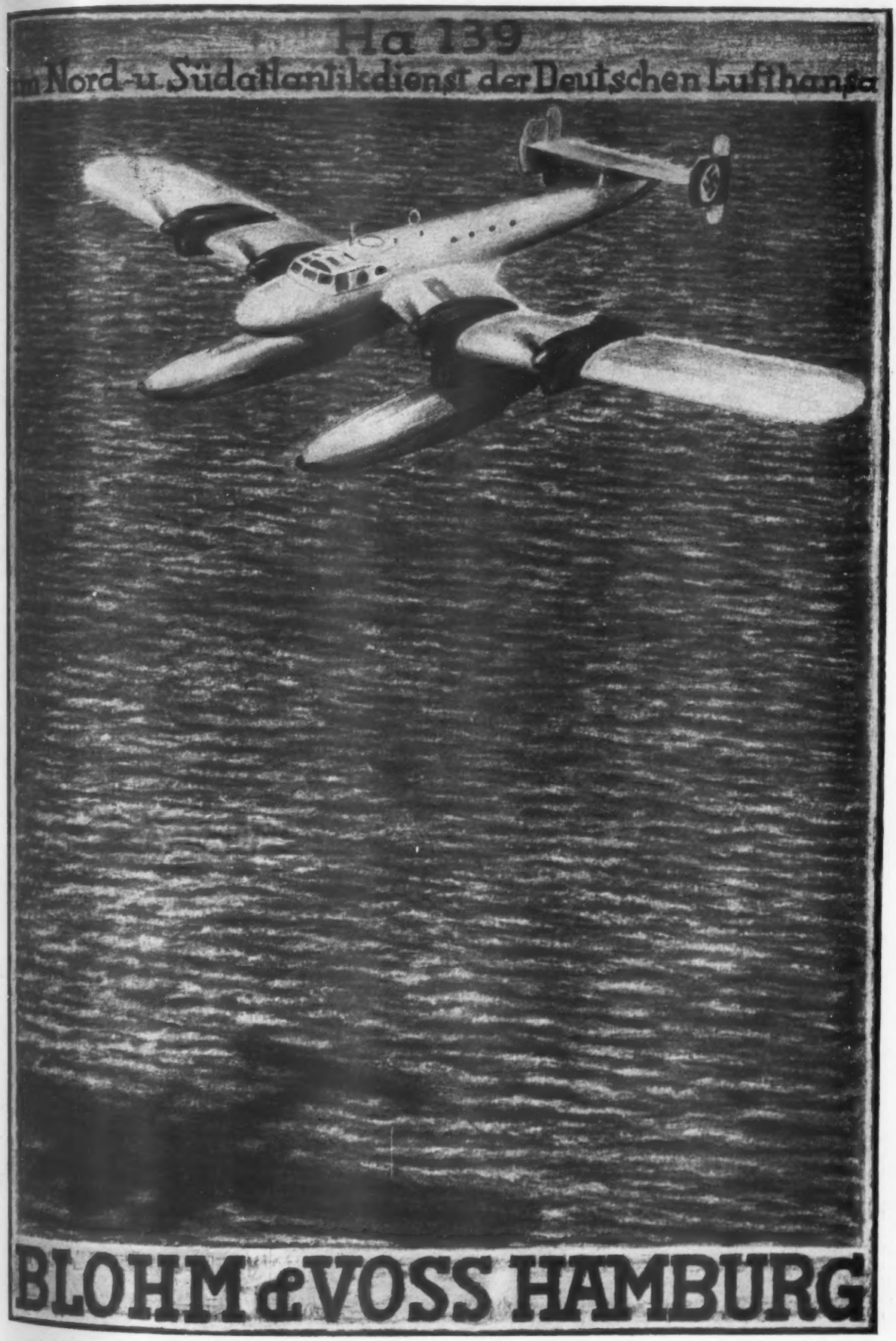
Both services pick up a lot of loose change, too, outside the direct appropriations and regular funds earmarked for general service allotments for pay, food, etc. The PWA and the WPA, for one example, have in recent weeks shaken down $11,500,000 for projects to improve landing areas, build hangars or erect quarters for Army airfields, March, Denver, Chanute, Chicago, Kelly, Randolph and McChord all cutting in for important shares. The same two agencies will spend $4,500,000 for improving Navy air base facilities at San Diego, San Pedro, Pensacola, Norfolk, Quantico, and Seattle. For another example, the Army Quartermaster Corps is turning over $4,403,400 to build barracks, headquarters buildings, hangars and a hospital and improve the runways at Scott Field, Illinois—to get it ready to house the commanding general and headquarters staff of the GHQ. Our strategists figured its present location at Langley Field was too open to enemy attack and not sufficiently centralized.

PROPS OPP.: Wright Field announces excellent results from two propellers mounted on a single engine yet geared to turn in opposite directions. Advantages — Balanced torques; less slipstream twist; smaller diameters.

Add it all up and it comes to something like a quarter of a billion dollars that Uncle Sam will this year spend on his aerial defenses. That's enough to make a Hooverian Budget director roll over in his political grave.

But let's read a few cables. Just a few from London will do. Last month the British government calmly upped its current RAF appropriations by $114,505,000 bringing its total for this year to no less than $632,005,000 . . . There is to be as quick an increase as possible in RAF personnel from 83,000 to 96,000. (Our Air Corps, Marine and Naval Aviation together total under 42,000) . . . British orders don't run thirteen to 250 of this or that type but for 100, 700, or even 1400 of each accepted model . . . Last month an order went out for a first order for 100 of the Short Sunderland patrol bombers, roughly equivalent to our Sikorsky "flying dreadnought" and Consolidated "flying battleship". And its doubtful the Sunderland has even now had as much testing as our two prototypes, still buried in the experimental category.

Fragmentations —Congress has appropriated $23,000,000 for increasing our anti-aircraft strength on the East Coast. $10,000,000 is intended for equipment. . . . Reports that the Navy would come into the Atlantic for maneuvers, after much denial and evident postponement, have taken on considerable reality. Early in January the fleet is to steam into the Caribbean to work out its "Problem 20", the defense of the Panama Canal, with the Army and Marines taking full part in the exercises. In May the fleet is to drop into New York—just to give the World's Fair a treat and vice versa . . . A "good will" flight of six bombers will proceed Aug. 6 from the Canal Zone to Bogata . . . 47 Consolidated PBY patrol bombers made a mass flight in July from San Diego to Seattle. Then, in two groups proceeded to Juneau and Sitka, Alaska, for maneuvers until August 15 . . . The C. G. has opened its beautiful new million dollar base at Floyd Bennett Field, Long Island. Congress has made appropriations for new C.G. bases at Elizabeth City, N. J., and San Francisco . . . Both Army and Navy have ordered curtailment of participation in air meets. The Army order specifies two, or not more than three per year . . . Many an airplane co-pilot is reported to have turned up for examination last month for 200 second lieutenancies in the Regular Army. Only Kelly Field graduates were eligible . . .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BLOHM & VOSS HAMBURG

AVIATION'S OPERATORS CORNER

Tagging the Bases with

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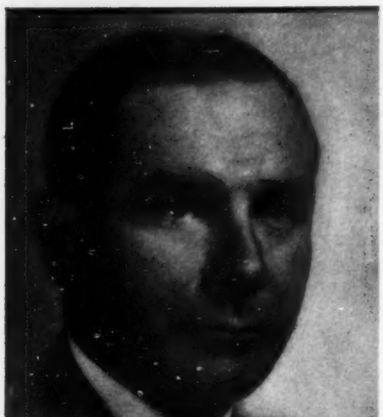


PRESIDENT: Wright Vermilyea, Jr., has been elected president and general manager of the Palm Beach Aero Corporation which has just been reorganized. Elaborate expansions for Morrison Field have been announced by the new president.

Pilots, aircraft manufacturers, insurance underwriters, and others got behind the "Ed Nilson Operator Plan" at a recent meeting of the Florida Aviation Association in Jacksonville. Briefly the plan enables a community without an airport to seek aid from the State Commission in securing a competent operator and a location for the field. The town agrees to help the operator financially for a year or two until he gets started and to build a hangar, deriving its benefits from sales and availability of aviation service to the community. New officers elected at the meeting were Orlando City Commissioner Wayne Gray, co-sponsor of the plan with Ed Nilson, President; Bill Lazarus, of Winter Park, secretary; and Airport Commissioner T. C. Imeson, of Jacksonville, first vice-president.

Palm Beach Aero Corporation will go places under the experienced direction of its new president and general manager, Wright Vermilyea, Jr. Ike was selected during the recent reorganization of the company. New vice-president and treasurer is J. Wesley Pape, of Cincinnati and secretary is State Attorney Phil O'Connell. Expansion plans include erection of a new hangar 160 ft. long and 130 ft. wide with a 25-ft. door clearance. Both 80 and 87 octane gasoline will be available. Scheduled service to Miami will be resumed this fall. And incidentally Ike reports that, on the Florida State Air Tour he wound up with the sale of three new Cub Sport planes.

Expansion of Bennett Air Service is announced by President Al Bennett. A seaplane division is in the process of formation and a New York office has been opened in charge of Jack Mason at 41 East 47th Street. Plane demonstrations are given by Mason at the Wall Street and Midtown (31st St.) Seaplane ramps. Richard H. Washburn has been made sales manager of the parent company.

Al Key, down in Meriden, Miss., tells us plans have been completed for the first Annual Mississippi Air Tour, which starts with a banquet and entertainment at Key Field August 23. The next day the tour will get underway visiting Newton, Macon, Starksville, Aberdeen (lunch and refueling), Houston, Tupelo and Corinth, where the night will be passed. On the following day the stops will be Oxford, Clarkesdale, Greenwood (lunch and refueling), Greenville, Vicksburg and Jackson. On Friday stops will be made at McComb, Columbia, Laurel, (lunch and refueling) Hattisburg, Gulfport, Pascagoula, and back to Biloxi for the official windup. On Saturday there will be deep sea fishing for all who want to stay. Gas and oil is being furnished to all entrants by the Gulf Refining Company through the cooperation of Ralph Lockwood.

Fifty-five airplanes turned up at the annual air demonstration and show at the Long Island Aviation Country Club, under the direction of Hank Kurt. The program consisted of an aerial parade followed by three hours of general flying by club members.

Seaplane services are springing up all over the country. Latest addition to the fast growing roster is of direct interest to New Yorkers. It is the Evers Flying Service operating out of three Manhattan Island ramps,—Wall Street; Duffy's Landing, North River

PRIVATE FLIERS FRIENDS: Ed Nilson (left) able aviation director and City Commissioner Wayne Gray of Orlando outlined their plan to fit responsible operators to municipal airports at a recent meeting at Jacksonville.

Record breakers: Pilot Clarence McArthur and the Delgado Flash flew a 62.737 mile closed course in 18 minutes, 4.5 sec. or 207.027 m.p.h., a-record speed for this type of ship. Like the Delgado Maid this ship was built by the Delgado Trades School in New Orleans.

at 79th Street; and Sky Harbor, East River at 31st Street. Charter service of all kinds will be available at any time. Operations are under the direction of Veteran Seaplane Pilot Carl Evers.

New York—Cape Cod week-end landplane service was started recently by the Airlines Ticket Agency of E. K. Smith, Inc. Limousines will leave the ticket office Fridays at 3:30 p.m. (D.S.T.) for Holmes Airport where airplanes depart at 4 o'clock. Arrival about two hours later at Nantucket, Edgartown, Hyannis and other points, gives passengers ample time for a swim and dinner. Stinson and Waco planes are used.

Both the name and management of one of the oldest airports in Southern California changed on July 1st. Dycer Airport is now known as the Southwest Airport, as E. A. Dycer, operator of the field for the past seven years, turned over the management to Elmer A. Riley, president of the Riley Flying Service. A. Dycer is giving all of his time in the future to the business of Dycer Aviation Supplies, specializing in airplane engines, parts, and accessories.

OPERATORS: At Southwest Airport (formerly Dycer) William Gage (left) and Elmer A. Riley (right) share the passenger business. In the center is Mrs. Eleanor Riley.

RUBBER FLOATS: Test flights have been underway on a Piper Cub fitted with pneumatic floats built of Goodyear airship fabric and inflated to very low air pressures. The floats are the invention of Captain Ashley C. McKinley, of Polar flight fame, and have been tested by Mike Thorne at the new Babylon (L. I.) Seaplane Base. Assisting in the development were Goodyear Fabric Expert F. N. Cooper and John Klein.

A crowd of 40,000 witnessed the annual Freddie Lund Memorial Air Show at Lexington, Ky. The performance featured the low inverted acrobatics of Lt. Joe Mackey. Don Walter, who flew a Gee-Bee racer and the rapid-fire announcing of Bill Sweet, Jr. David Binns made two parachute jumps.

Non-Scheduled Aviation, Inc., New California operator association, held its first formal Directors' meeting on June 21st. Membership has now passed 200 and the drive is gaining momentum. A nominating committee was appointed to draw up a slate of officers for the first year. The committee, consisting of Bertrand Rhine, E. A. Dycer, and Kenneth C. Hawkins, acting chairman of the board of directors, conferred with various men and drew up a tentative list of officers which is now only subject to formal approval of the board of directors. The unconfirmed list, available at time of going to press, included: C. F. Lienesch, Pres., E. A. Dycer, vice-president for schools; Judge B. Rey Schauer, vice-president at large; P. L. McMullen, vice-president for Northern California; Cecil Meadows, vice-president for the San Joaquin Valley; Douglas Kelly, vice-president for Southern California; Kenneth C. Hawkins, secretary; and Bertrand Rhine, treasurer.

REPORT CARD

Of Air School Developments

A recent announcement by Fred C. Parks, Registrar of Parks Air College, states that 35 hours of flight training has been added to the 265 hours formerly offered in the Professional Flight and Executive Course, making a total of 300 hours. The increased time involves no additional investment on the part of the student. Beyond this, the student also receives a two-year ground school course of 260 hours in meteorology, 127 hours in navigation, 348 hours in radio, 529 hours in air transportation, 1159 hours in aviation mechanics, and 468 in executive subjects. Of all the graduates in this course, 91 per cent are actively engaged in aviation, 65 per cent of them are in airline piloting. Construction work is under way on an addition to radio department at Parks. The new building will provide 432 sq. ft. of additional space. Shielded receiving and transmitting rooms will be included together with considerable new radio equipment.

The Richard F. Hoyt Memorial Seaplane Fellowship at the Guggenheim School of Aeronautics, New York University, goes to John D. Pierson, 430 Audubon Ave., The Bronx. Graduated last month from the Webb Institute of Naval Architecture, Pierson was ranking student in his class throughout his four years as an undergraduate. He will begin his graduate studies this Fall. The Fellowship carries a grant of $500 in cash and tuition remission per year, according to Dean Thorndike Saville. Selection committee consisted of B. V. Korvin-Kroukovsky, (Edo.), William Schwendler, (Grumman), Igor Sikorsky (Sikorsky), T. P. Wright (Curtiss-Wright) and Harry F. Guggenheim, chairman of the advisory committee.

An air traffic school has been established in New York City by Mr. Evans K. Smith, who for several years has been connected with various airlines and is at present head of a large aviation ticket agency. The course will require eight weeks and will be held in the evening. Classes will be held two hours each week-day evening for eight weeks. Lectures by air transport executives and visits at airports and ticket offices will be included in the curriculum.

Stevens Institute of Technology is now offering a program of evening graduate courses intended primarily for engineering graduates. A few of these courses are in the general field of business administration and are open to qualified persons who are not engineers. Courses carry graduate credit toward the degree of Master of Science for those who are admitted to candidacy for this degree. Each evening course is scheduled for one two-hour session per week for a semester of 15 weeks and carries 2½ credits. Preparation of four hours per session is expected. Subjects covered are engineering economics, problems of management and industrial psychology.

The metal shop at Casey Jones School of Aeroneautics, under the direction of George Caldwell, has recently installed the latest type of metal cutting band saw using four speeds. Students are made thoroughly familiar with the use and adjustment of any type and make of machine met with in metal shops in the industry. When training is completed, they can form any shape that can be formed on a brake and have extensive training on all types of metal aircraft shapes.

Practical airplane design and construction will be studied at the Lincoln Airplane and Flying School, under plans worked out by E. J. Sias, president. The students under the direction of staff engineers, are now at work on the design of the first ship. Following completion and flight tests, other units will be built. Each new plane will give students an opportunity to assist with drawings, blueprints, jigs, selection of materials and construction, as well as witnessing the test flight. As soon as one project is completed another will be started to give incoming students full opportunity to participate. The Lincoln School reports widespread interest in its new course in aeronautical engineering which has been carefully worked out in cooperation with staff engineers of the school, as well as engineers in the manufacturing industry.

32 new students added their names to the roster of Curtiss-Wright Technical Institute during the month of June and 18 received their diplomas and were immediately placed. The entire student body, faculty included, of Curtiss-Wright Tech were on hand at Clover Field in Santa Monica to witness the flight test of the DC-4. It is fitting to note that among the four men who went up in the initial flight of the DC-4, was Sam Beers, a Curtiss-Wright Tech graduate of 1932, who is doing electrical installation work at the Douglas plant.

LEARNING TO WELD: Students at the Aero Industries Technical Institute using a new 200 KVA resistance welder. It is identical to the type used in some of the large aircraft factories.

NEW LUSCOMBE: Fifty horsepower all metal light plane test flown at Mercer Airport, West Trenton, N. J.

Range vs. Payload

(Continued from page 27)

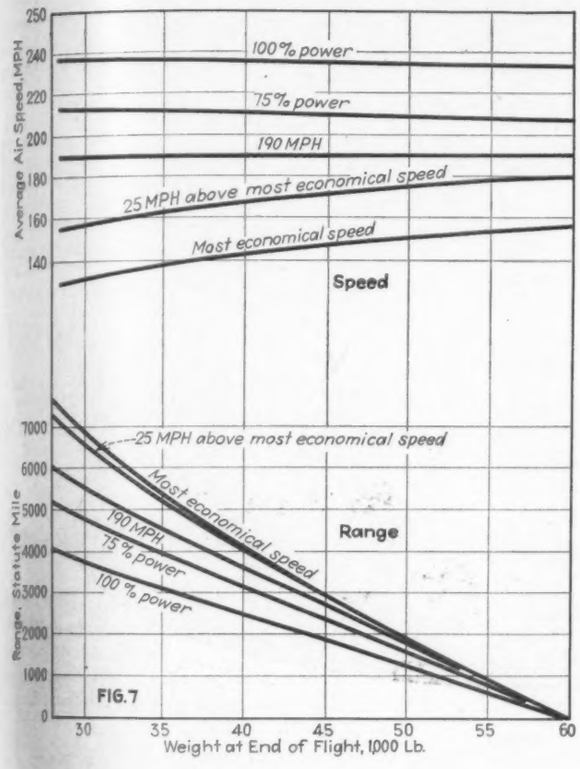


FIG. 7

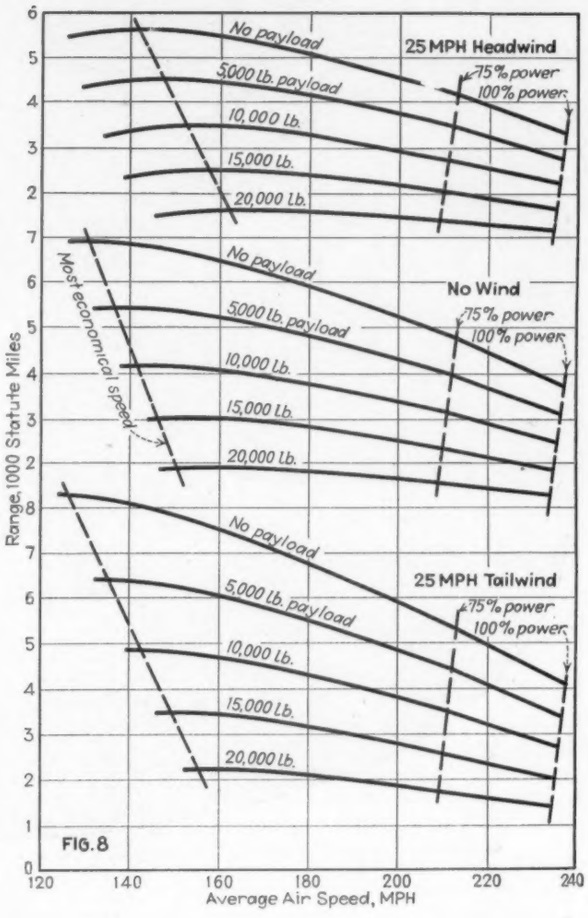


FIG. 8

2000 sq.ft. and a span of 140 ft. The relation between drag coefficient and lift coefficient is given by figure 1. The engine fuel consumption is defined by figure 2 for cruising conditions. The full power specific fuel consumption is .45 lb. fuel per brake horsepower hour.

The principle calculations are performed in Table I. The column headings are self explanatory in general. The calculations are made at several values of lift coefficient C_L (1). Each value of C_L corresponds to a given attitude, Cd (2), and η P_e (3). These values are listed in the first three columns. For cases with only two engines operating the drag of a full feathered propeller was added to the airplane drag and η P_e is based on two propeller disks instead of four. From the propeller chart (Fig. 9) various values of η (5) and V/ND (4) are chosen at the values of η P_e given in column 3. Several values of weight are listed in column 6. The air speed (7) is determined as a function of C_L (1), Weight (6), and altitude. The thrust horsepower (8) is determined from the velocity (7) drag coefficient Cd (2), and altitude.

The brake horsepower (9) is determined from the thrust horsepower (8) and efficiency (5). The engine RPM (11) is determined from the velocity (7), V/ND (4), propeller diameter, and gear ratio. The brake mean effective pressure BMEP (12) is determined from the BHP/Eng. (10), RPM (11) and engine displacement. The specific fuel consumption S.F.C. (13) is determined from Fig. 2 and the engine RPM (11) and BMEP (12). The pounds of fuel used per hour (14) is obtained from the BHP (9) and S.F.C. (13). The miles travelled per lb. of fuel used (15) is determined from the speed (7) and the #/Hr. (14). Thus column 15 gives values of specific range, Mi./lb. of Fuel, as a function of weight (6), speed (7), RPM (11), and BMEP (12). The effect of shutting off two engines is also shown.

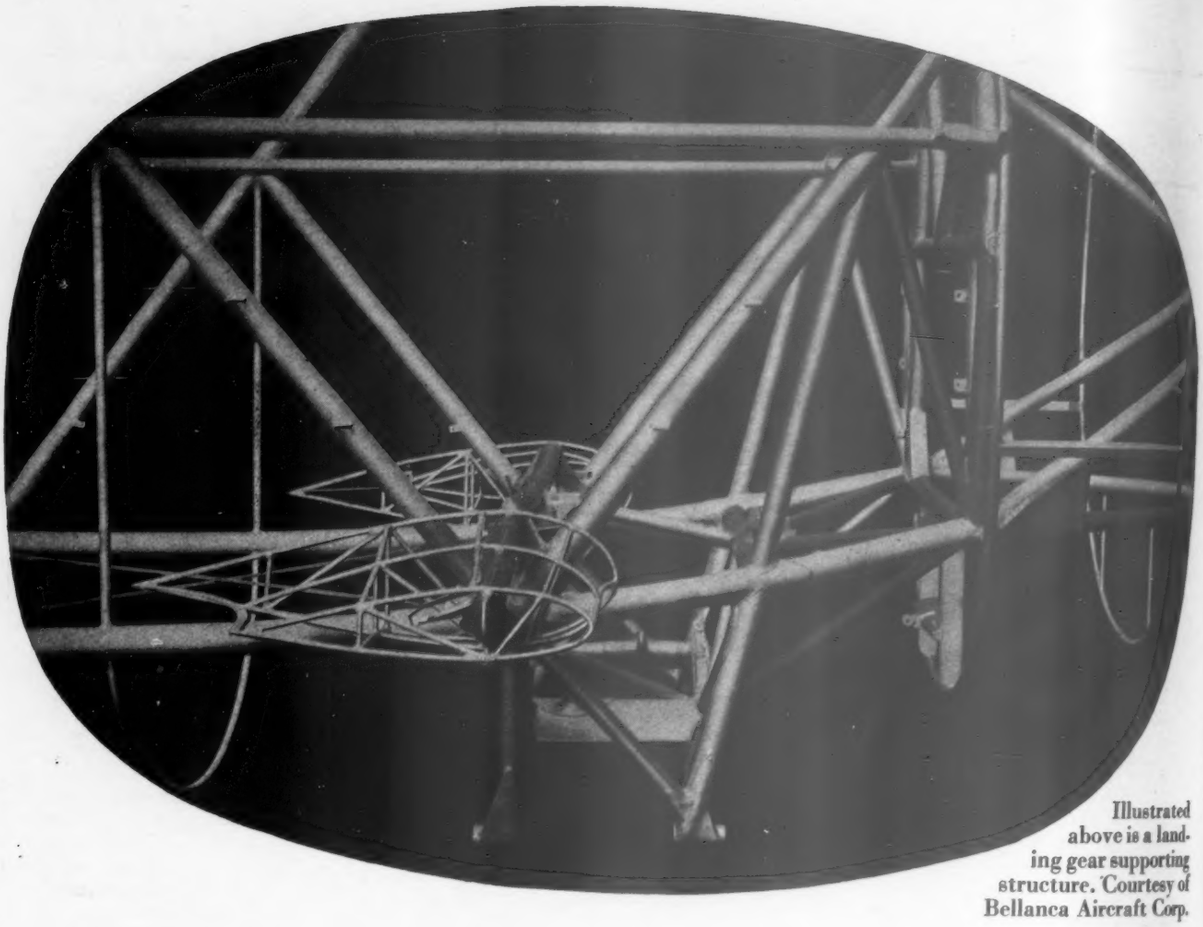
At the bottom of Table I the thrust horsepowers at certain high speeds and weights are calculated. These values are plotted in Fig. 3 as well as curves of power available for the engine operating at full power and also at 75% power. This gives the last six rows of Table I which are for range at full or 75% power.

In order to find optimum conditions the specific range is plotted against BMEP in Fig. 4 for each weight and speed calculated. The peaks of these curves are optimum range points. These points are replotted in Fig. 5 to show the effect of speed on specific range and specific endurance at the three weights used.

If the gross weight of the airplane is 60,000 lbs. and the oil consumption is 5% of the fuel consumption; then the three weights represent three amounts of fuel consumed. Using this relation the effect of fuel consumed or weight on specific range and specific endurance are plotted in Fig. 6. This is done for five operating conditions.

The range is found by multiplying the specific range by the pounds of fuel consumed. With varying specific range it is necessary to integrate the range. This can most readily be done by measuring the area under the

(Turn to page 74)



Illustrated above is a landing gear supporting structure. Courtesy of Bellanca Aircraft Corp.

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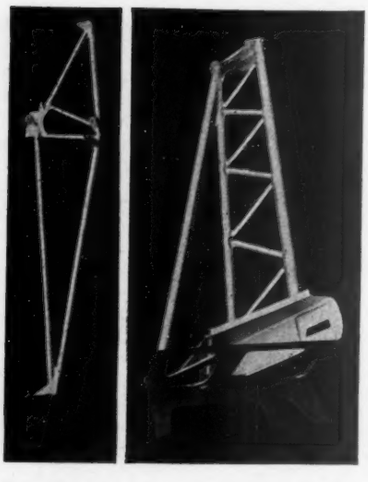

Landing gear truss units for installation in wings. Courtesy Bellanca Aircraft Corp.

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Range vs. Payload

(*Continued from page 71*)

specific range curves in Fig. 6, from no fuel consumed to any value of fuel consumed. The endurance or time required to consume any given quantity of fuel is similarly found by integrating the specific endurance curves of Fig. 6. This has been done and the results are plotted in Fig. 7 as range versus weight at the end of the flight for the five conditions. Also plotted are the average speeds during such flights which are obtained by dividing range by endurance.

In order to plot the results in the most comprehensive manner the range-payload-speed chart shown in Fig. 8 has been plotted. This chart is obtained from Fig. 7 by plotting range versus speed for a given weight at the end of the flight. For the example airplane the weight of the airplane minus fuel, oil and payload is 30,000 lbs. The difference between 30,000 lbs. and the weight at the end of the flight is payload. Thus, for constant values of payload, curves of range versus speed can be plotted. This was shown in the middle of Fig. 8 for no wind. This chart is modified at the top and bottom of Fig. 8 to represent the range versus speed with a 25 MPH headwind or tailwind. This is done by multiplying the range by the ratio of ground speed to air speed. The difference between these speeds is the wind velocity. This one chart presents the complete range, speed, payload picture for this airplane.

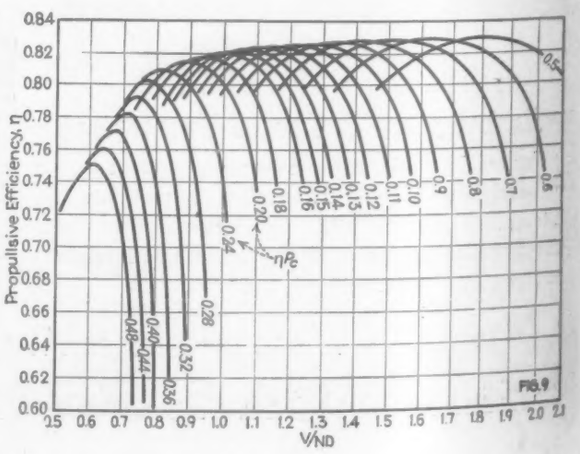
It will be noted in the foregoing that no allowance has been made for loss in range due to fuel used in take-off and climb nor for gain due to the descent at the end of the flight. Practically this omission is probably entirely justified.

An examination of the results for the example airplane will show many interesting things about range. The results for the example airplane are in all ways typical of nearly all long range airplanes. It is seen in Fig. 4 that at high weights and speeds the BMEP may become quite large and, in fact, the optimum value of BMEP may exceed the manufacturer's cruising rating. In these conditions the engine will be operated at full cruising throttle during the first portion of the flight. This is true of most airplanes.

It can be shown that for fixed C_L, η P_e, and V/ND the engine BMEP is proportional to weight and independent of altitude. It can also be shown that speed and RPM for these same conditions are a function only of altitude and weight. This represents a slight increase in SFC with altitude on Fig. 2. It is assumed that the SFC values as given in Fig. 2 are independent of altitude. This is not necessarily true but it can be seen that within close limits there is very little change in SFC with altitude. Since the BHP increases proportional to the speed with increasing altitude, the miles per pound of fuel or specific range is nearly independent of altitude at constant C_L. The only appreciable effect of altitude therefore is to increase the airspeed.

An examination of Table I shows that the best specific range is not at maximum propullsive efficiency nor at minimum specific fuel consumption. In general the best condition occurs with an efficiency several per cent below maximum. Practically this occurs at quite low values of RPM and shows that for best range the engine must be throttled by increasing the propeller pitch rather than by closing the engine throttle.

It is seen in Fig. 5 that the speed for best range decreases with decreasing weight. This is contrary to popular belief. Actually it is found that best range occurs at very nearly constant C_L and this constant value of C_L is a value somewhat less than that for maximum L/D. If SFC and propullsive efficiency were independent of C_L and Cd. maximum range would occur at maximum L/D. Actually the maximum propullsive efficiency decreases with increasing η P_e as seen in Fig. 9. Also the SFC increases with decreasing power at large C_L. Both of these effects make maximum range occur at a speed somewhat greater than that for maximum L/D.



Refering to Fig. 8 the effect of average speed on range can be seen. The loss in range when flying at speeds 20 or more miles per hour above speed for best range is very small. This is particularly true for larger payloads where the effect of speed on range is relatively small.

With a 25 MPH headwind best range occurs at a speed somewhat greater than for best range with no wind. Furthermore the range is less sensitive to speed with a headwind. The converse is true for a 25 MPH tailwind. Figure 8 also shows the effect of payload on range. This chart in itself is the answer to the question of Speed vs Payload vs Range for this airplane and is typical of all long range airplanes.

The performance with two dead engines is very interesting. The figures are based on a stopped and fully feathered propeller. Under these conditions a net gain in range is shown for the case of two dead engines. This is not shown on Figs. 7 and 8 as the total gain is only about 65 miles for the best condition. The interesting thing is that two engines are not being used at all and the other two are operating at normal conditions rather than at extremely low power. This should decrease operating costs and increase the safety factor. It is thus economical to shut off engines as soon during flight as the remaining engines will be capable within their cruising ratings of maintaining flight. This is based on the use of full-feathering propellers. With propellers with limited pitch range the stopped propeller drag may be great enough to cause a loss in range. Some drag can be saved by shutting off all cooling air flow through the stopped engines.

The procedure used in this report to estimate range offers also a very

(*Turn to page 77*)

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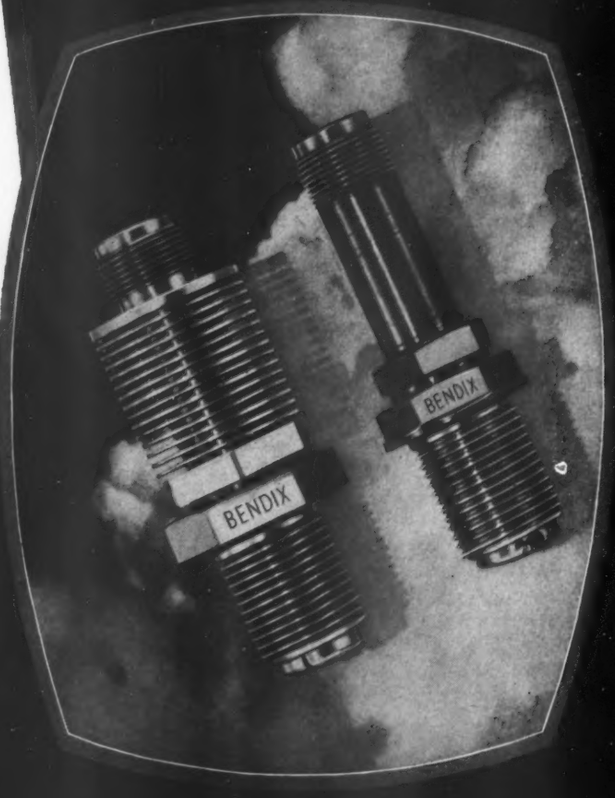

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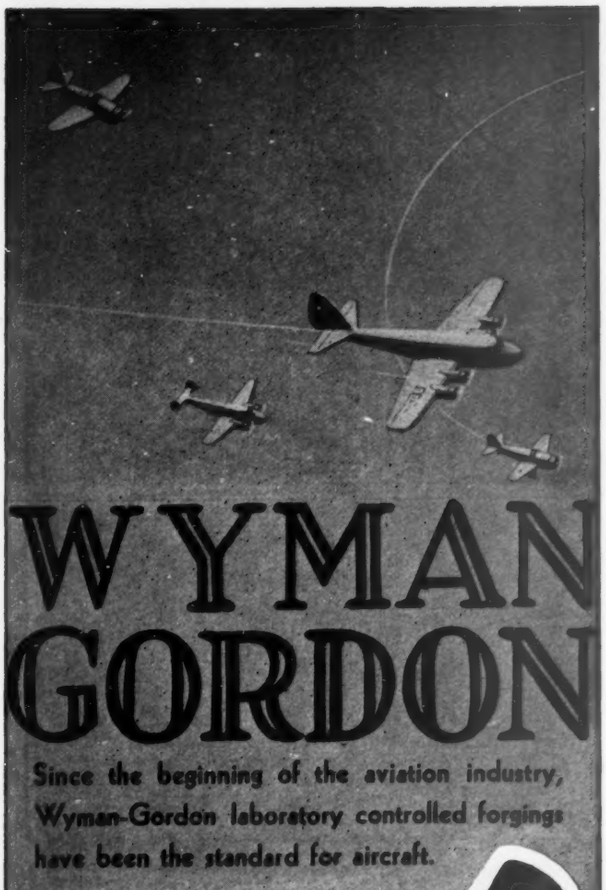

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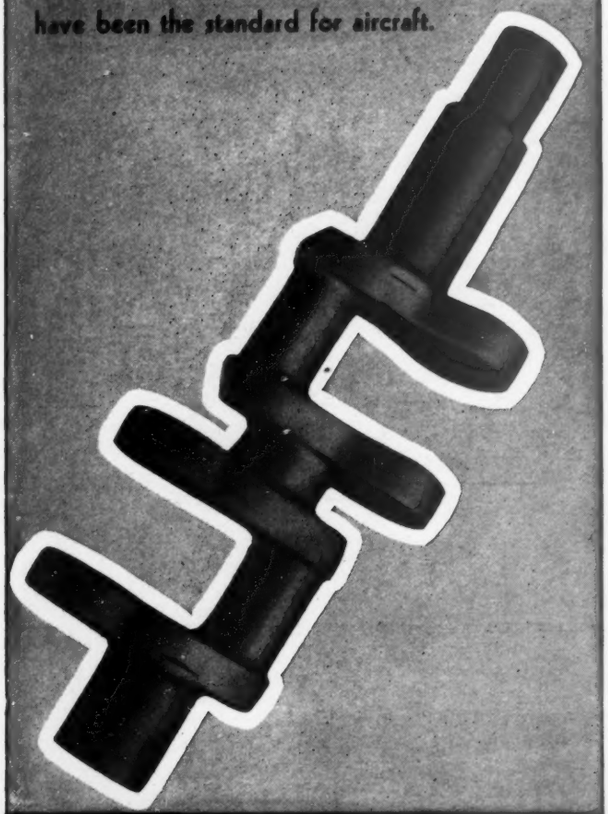

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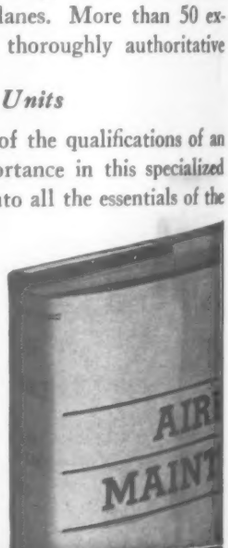

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(*Continued from page 49*)

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The ease with which the instrument may be used is illustrated by Mr. Connors' experience. He had never seen or handled one until about two days before the Hughes Round the World Record Flight. Ten minutes of explanation and two hours of practice made him proficient in its use.

Hughes Radio

(*Continued from page 22*)

Radio headquarters for the flight communications system were set up at the regular flight headquarters at the New York World's Fair. This was the control point for the activities of two amateur stations located at Quogue, L. I. and Hermosa Beach, Cal. An amateur transmitter was also operated from the World's Fair headquarters to maintain contact with the plane on the Atlantic crossing. Four receivers, all National HRO types, were used at the Fair station both in gathering the weather information as well as in monitoring the plane's frequencies. The station at Quogue was W2UK owned by Ralph Thomas and employing two more HRO receivers in conjunction with a 1,000 watt transmitter and several directional antennae. W6CUH, Perrine's amateur station, was the station used at Hermosa Beach. There two HRO receivers were used for weather data and plane contacts. The transmitter power of 1,000 watts was increased several times in the direction of Siberia by a beam antenna erected especially for this flight.

All three transmitters operated on CW and were adjusted to operate on identical frequencies of either 7,000 or 14,000 kilocycles. This fact was of importance in contacting the plane because then any one of the three stations could work with the plane without requiring any change in tuning of the plane's receiver. It also simplified intercommunication between the three amateur stations for relay purposes. Several times messages received at one of the stations were relayed to the headquarters station less than one minute later.

It was originally intended to maintain definite schedules for contact with the plane but the nature of the radio work on the plane as it developed soon put schedules out of the question. This was because the crew found far more direction finding work necessary than had been foreseen. An arrangement was therefore worked out after the flight was under way, to have one of the nearest ground stations call the plane periodically. In that way, the plane could answer if radio conditions were satisfactory without having to waste too much time in transmitter and antennae adjustments. This placed the burden of attempting to make contact on the ground station where it could be handled conveniently.

Shortly after leaving Yakutsk the plane contacted W6CUH at Hermosa Beach and established communication with both CW and phone. The distance between the two at the time was approximately 5,000 miles which should constitute real DX for radio communication from a plane, especially on phone.

Hughes Weather

(*Continued from page 23*)

Mr. Hughes and the crew might have a forecast for the next leg awaiting them on their arrival. Once or twice during the flight supplementary forecasts were radioed directly to the plane by Mr. Perrine from the station at the World's Fair in order that advantage might be taken of more recent data, with the attendant increase in accuracy in the forecasting.

Range vs. Payload

(*Continued from page 74*)

practical method of flight testing for range. The recently developed torque meter allows the test pilot to read engine torque or BMEP. The airspeed meter, altimeter, thermometer, fuel flow meter and tachometer give the additional data required. The weight during the tests must be known. The true airspeed is calculated and divided by the fuel flow to obtain values of specific range. These values can be plotted as in Fig. 4 and remainder of computations can be carried out as in estimate.

Another interesting possibility is the checking of propeller data. The V/ND and P_e of each test point can be calculated. The points at constant speed, altitude and weight represent constant ηP_e. By plotting $1/P_e$ versus V/ND curves can be drawn similar to those in Fig. 9 but with the ordinates divided by ηP_e. The location of the peak efficiency and the shape of the curve can be checked against Fig. 9 to obtain ηP_e and to check the propeller data. The airplane drag coefficient can be obtained from ηP_e. If this is done at various speeds and weights the propeller chart can be fairly well checked. It is hoped that flight tests of this type will be made in the near future to check data. In studying Fig. 9 it is noted that the shape of the curves for various values of ηP_e is nearly the same. It is found that the loss in efficiency below peak efficiency for a given per cent increase in V/ND above that for peak efficiency is nearly the same for all values of ηP_e. This interesting fact may lead to further developments in propeller testing and range computations.

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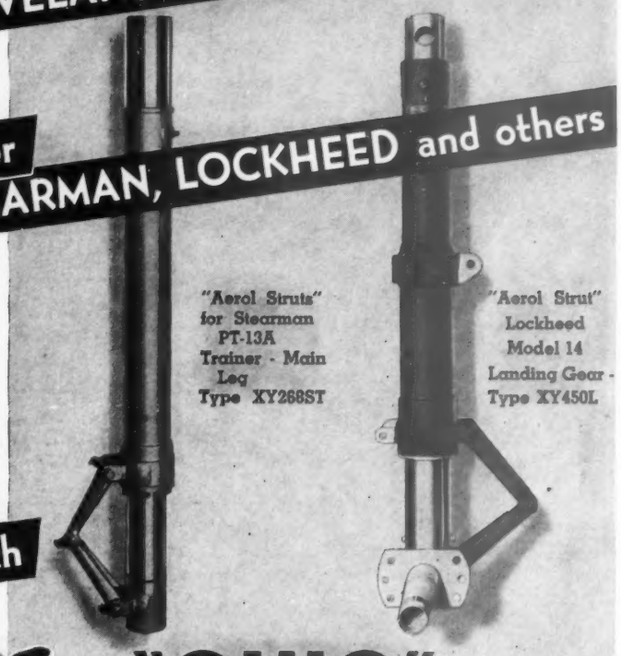

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C. W. Model 20

(*Continued from page 46*)

prevent skin wrinkles (also found to be advantageous structurally); and a perfectly streamlined shape of fuselage. All these contribute to low drag—the elimination of the wasting of engine power. Again, no time or expense has been spared to approach as nearly as possible to the aerodynamically perfect airplane.

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The Curtiss-Wright "20" described above has been designed and is now being built. Plant facilities have been augmented by the addition of many up-to-date machine tools and much special equipment needed for fabricating this airplane. A well-rounded out organization is working, pushing it through to completion at the St. Louis Airplane Division plant of the Curtiss-Wright Corporation. Mr. Charles W. France, with years of transport operating experience, heads up the group. Mr. Lessiter C. Milburn, long known to American aviation is Works Manager, and Mr. George Page, designer of the "Condor" and many other successful Curtiss designs, is Chief Engineer. He is assisted by Mr. Lombard, Mr. Perkins, and others, there being more than one hundred engineers and draftsmen now engaged on the project.

The machine is scheduled to fly by the first of the year. It will, it is believed, be a worthy addition to the fine line of air transports designed and produced in this country and used throughout the world. Designed with full cognizance of requirements of comfort, convenience and performance; and with full recognition of market and traffic requirements, it particularly emphasizes in its design—Safety and Economy.

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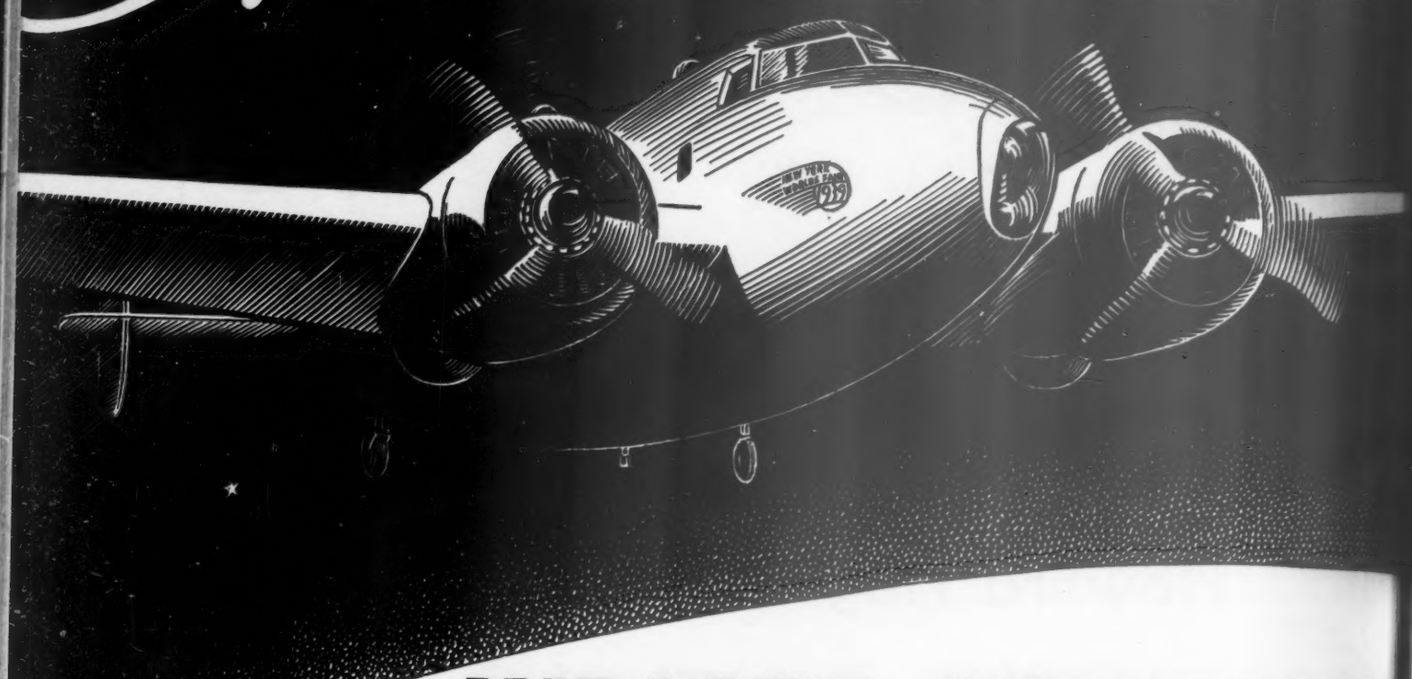
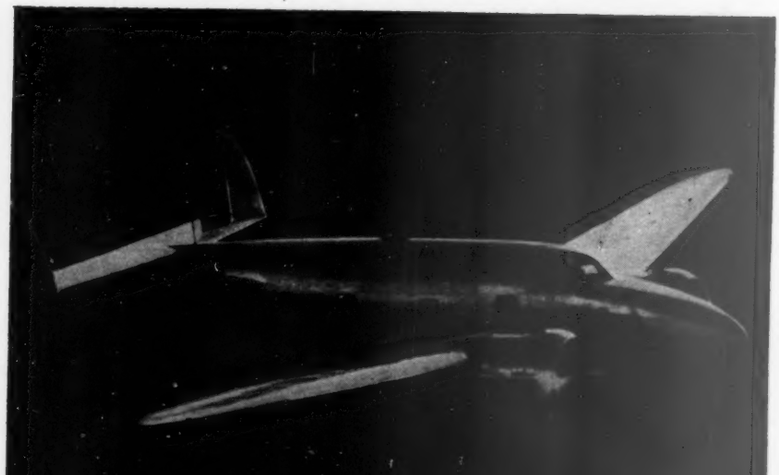


WRIGHT CYCLONES



International News Photo

In 3 days and 19 hours, Howard Hughes and his aide companions, flying a Lockheed 14 transport, powered by two 1100 H.P. Wright Cyclones, reduced by half the popular conception of the size of the world.

The most impressive thing about this flight is not the fact that it halved the previous record, but rather the precision with which it was accomplished. Every step was carefully planned, then executed with faultless precision.

It is a tribute to modern engineering that this record-breaking flight was established in a standard transport airplane—a Lockheed 14 of the type now in regular service on airlines both here and abroad, particularly on K.L.M. and K.N.I.L.M. where they are powered by Wright Cyclones.

On take-offs, with an additional load of nearly [illegible] tons over the normal rating of the Lockheed 14, Howard Hughes could tap the tremendous reserve of the 2200 H.P. furnished by his two Cyclones.

The amplitude of this reserve is emphasized by the conservative manner in which the engines were

WRIGHT AERONAU

PATERSON, NEW JERSEY

3 DAYS--19 HOURS

Congratulations

HOWARD HUGHES

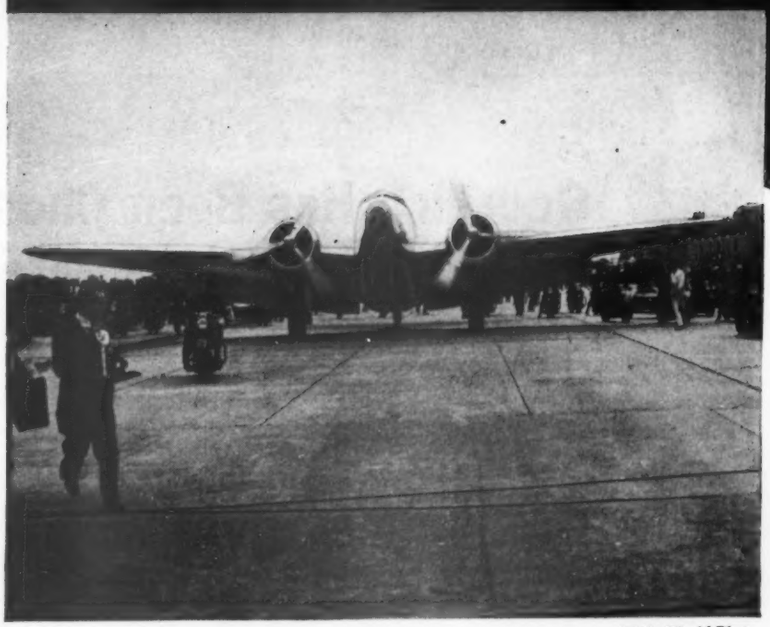
And your Courageous Crew!

THOMAS L. THURLOW, Navigator
(First Lieutenant, U. S. Army Air Corps)

HARRY P. McLEAN CONNOR, Navigator
(Lieutenant, U. S. Naval Reserve)

RICHARD STODDARD, Radio Engineer

EDWARD LUND, Flight Engineer



Wide World Photo

You and your able companions who circled the globe in such an incredibly short space of time rightly deserve the plaudits of the world.

Of even greater importance than your speed is the highly successful scientific experiment you have conducted which should contribute so much to the future of long-distance flight.

And too, you have realized the hope that you expressed when you set out from Floyd Bennett Airport on the eve of your famous flight: *"We hope that our flight may prove a contribution to the cause of friendship between nations, and that through their outstanding fliers for whom the bond of aviation transcends national boundaries, this cause may be furthered."*

Selected to power the LOCKHEED 14 *. . . . on this* RECORD-BREAKING FLIGHT . . . .

cruised to maintain the remarkable average of 206.7 m.p.h. for the flight. Only 500 H.P. to 590 H.P. of the 625 H.P. cruising power approved by the U.S. Department of Commerce was used, which left a huge reserve of power in each engine.

Wright Cyclone 1100 H.P. engines of the type selected by Howard Hughes for his Lockheed 14 power transports on American Airlines, Eastern Air Lines, Pan American Airways System and Transcontinental & Western Air. Recently released for export sale, Cyclones of this type are also installed in transports now in service on K.L.M. (Royal Dutch Air Lines), K.N.I.L.M. (Royal Netherlands Indies Airways), Pan American Grace Airways and Swiss Air Lines.

Dependability under the hard gruelling conditions of commercial air transport operations—the dependability so convincingly demonstrated by this record-breaking flight around the globe—has made the Wright Cyclone the choice of leading airlines throughout the world.

CAL CORPORATION

A Division of Curtiss-Wright Corporation

FOR THOSE HEAVY-LOAD TAKE-OFFS AND LANDINGS . .

HOWARD HUGHES USED GOODRICH TIRES!

Goodrich Has Been Chosen Again and Again For Aviation's Greatest Achievements

TO Howard Hughes—to Lt. Thomas Thurlow, Harry P. M. Connor, Richard Stoddart, Edward Lund and to everyone who made his round-the-world flight possible—an admiring world says, "Well done." And Goodrich Tires—veterans of practically all of the world's most important flights once again demonstrate their ability to give extra safety—"cushioning" 12 tons on take-offs and landings clear around the globe!

Yet remember, it's not only in these world-startling, history-making flights that Goodrich demonstrates extra safety. Goodrich Airplane Silvertowns . . . Goodrich DE-ICERS . . . the *new* Goodrich E.T.* Brakes and over 40 other Goodrich Aviation Products quietly demonstrate this safety every day in the ordinary, routine service of the world's leading pilots, plane makers and air lines.

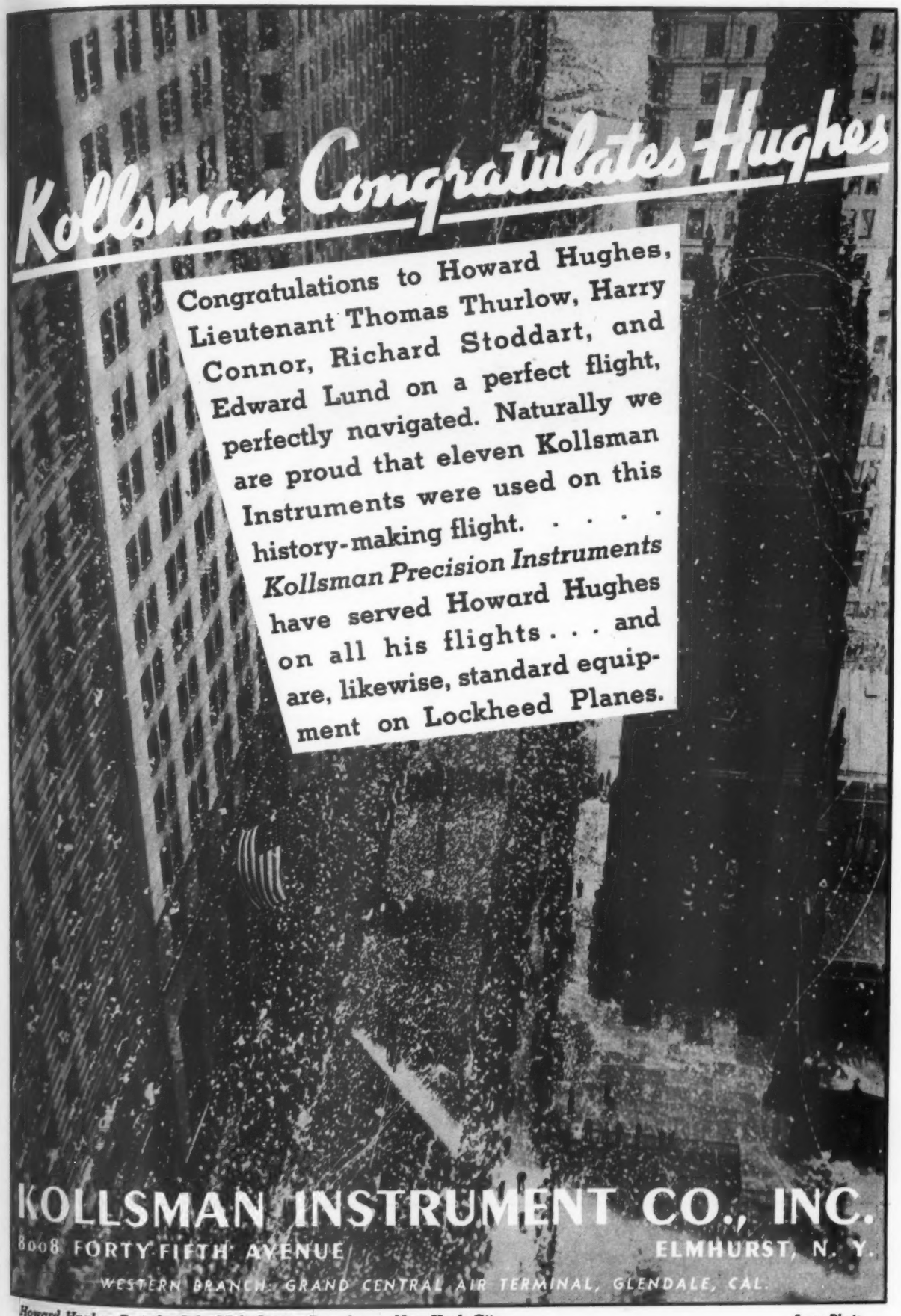
When specifying rubber products for planes, remember that only Goodrich can offer you this longer, more valuable experience in aviation. Write Dept. 662, Aeronautical Division of The B. F. Goodrich Co., Akron, Ohio, for complete information. Ask for a copy of "Goodrich In Aviation."

*Expander Tube

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes — including Tires — Tail Wheels — Abrasion Shoes — DE-ICERS — Matting — Rubber Hose — Grommets — Shock Absorber Cord — A Complete Line of Rubber Aeronautical Accessories.


Kollsman Congratulates Hughes
Congratulations to Howard Hughes, Lieutenant Thomas Thurlow, Harry Connor, Richard Stoddart, and Edward Lund on a perfect flight, perfectly navigated. Naturally we are proud that eleven Kollsman Instruments were used on this history-making flight. . . . . Kollsman Precision Instruments have served Howard Hughes on all his flights . . . and are, likewise, standard equipment on Lockheed Planes.
KOLLSMAN INSTRUMENT CO., INC.
8008 FORTY-FIFTH AVENUE
ELMHURST, N. Y.
WESTERN BRANCH: GRAND CENTRAL AIR TERMINAL, GLENDALE, CAL.

Howard Hughes Parade, July 15th, Lower Broadway, New York City — *Acme Photo*

THE FAMOUS *Lockheed of Howard Hughes "New York World's Fair 1939." The front and rear crank-shafts of both engines turned on SKF Bearings. One of the three-bladed propellers that pulled her 'round the world also turned on SKF Bearings.*

4195

Howard Hughes Makes it on SKF's

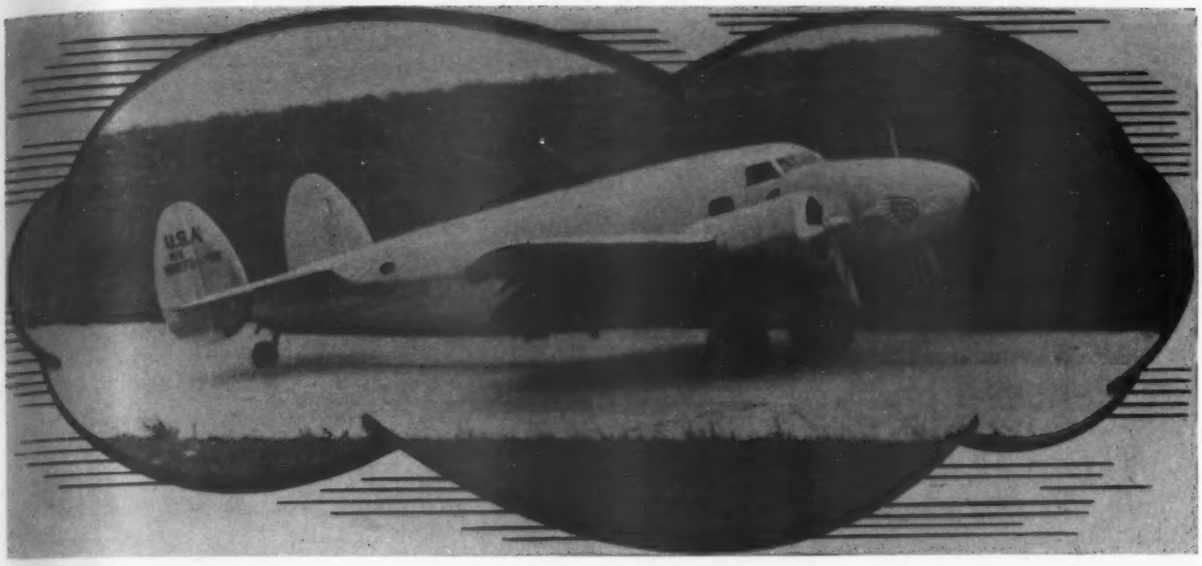
A little more than ten years ago it was the famous Spirit of St. Louis writing new aviation history across the clouds of mid-Atlantic with her single Wright Whirlwind Motor turning, hour after hour, on SKF Bearings!

And now another ship, the famous Lockheed, piloted by Howard Hughes and his intrepid crew, Lt. Thomas L. Thurlow, Harry P. M. Connor, Richard R. Stoddart, and Edward Lund—writes another startling page. This great plane represents all the startling improvements and all the new features that have been developed through another flying decade. A newer ship—a faster ship equipped with every new device that the engineering genius of a great industry has conceived.

And yet, she has this much in common with the old Spirit of St. Louis and with every other ship that ever took off on a successful transoceanic flight: She made it on SKF's!

On the long list of aircraft that have been SKF-equipped appear such world-renowned names as the Spirit of St. Louis, the Columbia, the America, the Question Mark, the Winnie Mae, the Martin Clipper Ship and planes of the great air transport companies and of the United States Army and Navy. SKF Industries, Inc., Front Street and Erie Avenue, Philadelphia, Pa.

SKF BALL AND ROLLER BEARINGS



FIVE MEN . . . A PLANE

. . . *AND BREEZE SHIELDING*

The greatest example of perfection in modern flight is the globe-circling jaunt of Howard Hughes and his four skilled technicians in their Wright Cyclone powered Lockheed 14.

Radio was used on this flight more successfully than on any previous long distance flight. Constantly and unfailingly Breeze Radio Shielding on both engine and plane were on the job—proof of the value of Breeze service to the industry.

Behind the glory and heroism of this great flight, lies a wealth of research, thought and tireless effort. Breeze is proud to have played a part in the preparations, thus contributing to the success of this epic adventure of five great men and their plane.

BREEZE MARK

Breeze Products and their proven dependability are available to you.

AIRCRAFT PRODUCTS

Radio Ignition Shielding Assemblies (including Spark Plug Shielding)
Flexible Conduit and Fittings
Junction Boxes
Flexible Shaft and Case Assemblies for Remote Control, Tachometer Drives, Fuel Pump Drives, etc.

Aeroflex Flexible Gas and Oil Lines
Internal Tie Rods
Ammunition Rounds Counters
Radio Tuning Units
Propeller Pitch Controls
Generator and Ignition Filters
Elevator and Rudder Tab Controls

Flexible Tubing of Stainless Steel, Aluminum, etc.
Exhaust Gas Analyzers
Fuel and Oil Tanks
Engine Cartridge Starters
Spark Plugs (shielded and unshielded)
Multiple Circuit Electrical Connectors

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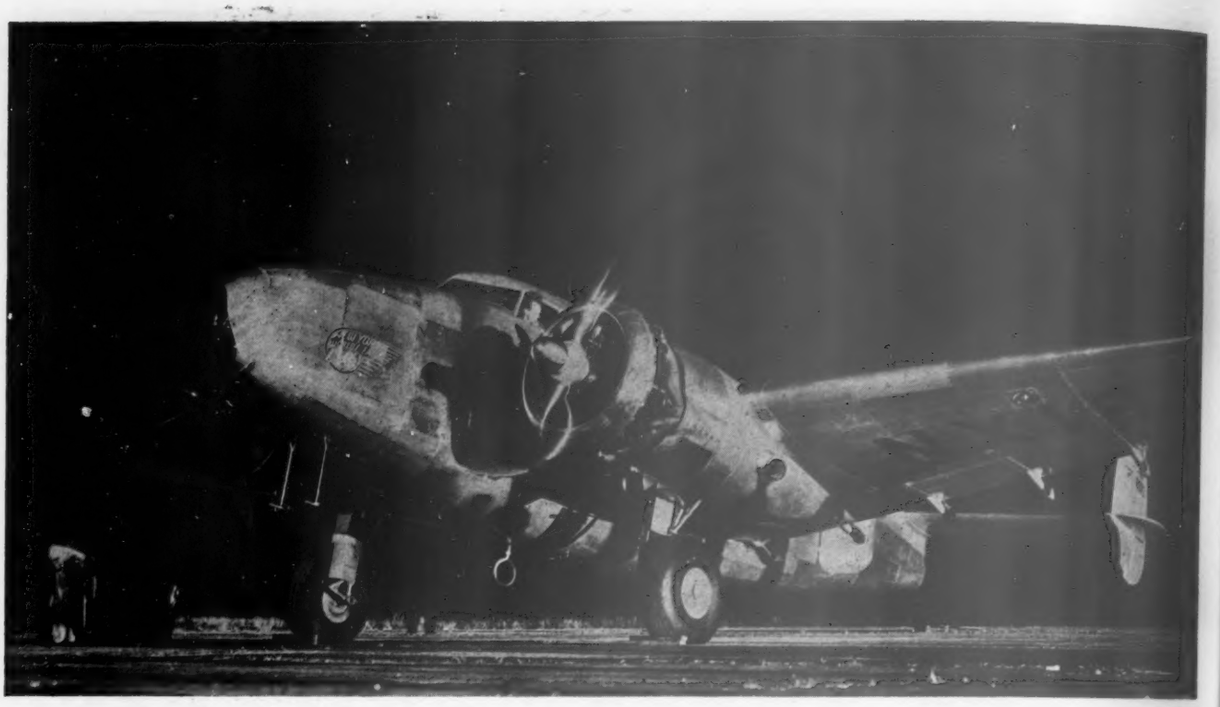
Pioneers in the design and development of stainless steel structures and stainless steel fabricated products.

REGULAR CONTRACTORS TO THE U. S. GOVERNMENT

BREEZE

CORPORATIONS, INC.

41 SOUTH SIXTH STREET • NEWARK, N. J.



PERFECT FLIGHTS DON'T JUST "HAPPEN"

★ Howard Hughes' epoch-making flight represents more than an outstanding achievement, it also represents an engineering achievement unsurpassed in aeronautical history.

Every material and part used in the plane was chosen with an uncompromising determination that it must be the finest available.

Under these conditions it is only natural that Mr. Hughes' Lockheed was equipped with Aerol Shock Absorbing Landing Gear Struts which are accepted by the industry as standard.

To support this selection engineers find an ample background of proven performance. For over twelve years Aerol Struts have enjoyed a preferential position in the industry. They went with Byrd to the South Pole—with Ellsworth to the Antarctic —with Sir Hubert Wilkins in his several Polar flights. They flew with Dick Merrill in his two round trips across the Atlantic. They are on the big ships like the Douglas DC4, the Boeing XB15 and YB17, the latter the famous "Flying Fortress". Every day thousands of Army, Navy, Transport, and Training planes make better take-offs, safer and softer landings on Aerol Struts.

To any engineer not familiar with the exclusive air-and-oil principle of these struts we offer the services of our Technical Department.

THE CLEVELAND PNEUMATIC TOOL COMPANY

CLEVELAND, OHIO, U. S. A. **CABLE ADDRESS—"PNEUMATIC"**

★ ★ ★

AEROL *shock absorbing* STRUT

CONGRATULATIONS

TO HOWARD R. HUGHES • LT. THOMAS THURLOW • HARRY P. M. CONNOR
RICHARD STODDART • EDWARD LUND

ON their record-smashing 91-hour flight around the world Howard Hughes and his companions used Goodyear Airplane Wheels and Hydraulic Brakes — *standard landing gear on all Lockheed planes because long experience has proved its sturdy dependability.* On stout Goodyear Wheels the heavily laden 12-ton ship roared down the runways into the air. Under the powerful, velvet-smooth, non-freezing action of Goodyear Hydraulic Disc Brakes it pulled up to safe, quick stops. Goodyear is proud of the part its equipment played in this great flight. Wouldn't it be a good idea to have this super-tested landing gear on your ship, too!

Goodyear Airplane Wheels and Hydraulic Brakes used on historic globe-girdling flight.

On your new ship specify

GOODYEAR

AIRPLANE WHEELS AND BRAKES

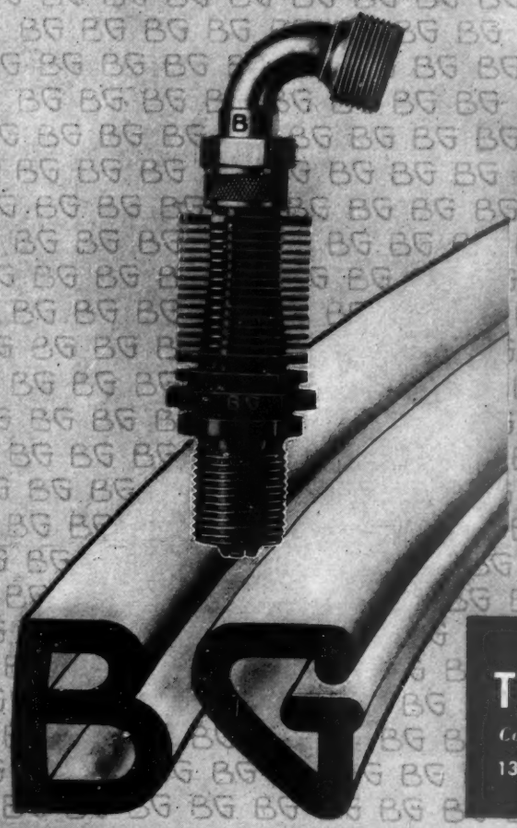
Our Compliments to

HOWARD HUGHES

LT. THOMAS L. THURLOW
HARRY P. M. CONNOR
RICHARD STODDART
EDWARD LUND—

BG spark plugs were used in both Wright engines for the entire trip, and it was not necessary even to change a spark plug

—and to Wright and Lockheed and the other manufacturers whose products were used on this record-breaking flight around the world.



We are proud of the fact that Mr. Hughes flew with BG spark plugs and that they continue to prove their reliability under every flying condition. It is that reputation which has made these plugs

THE CHOICE OF THE AVIATION INDUSTRY

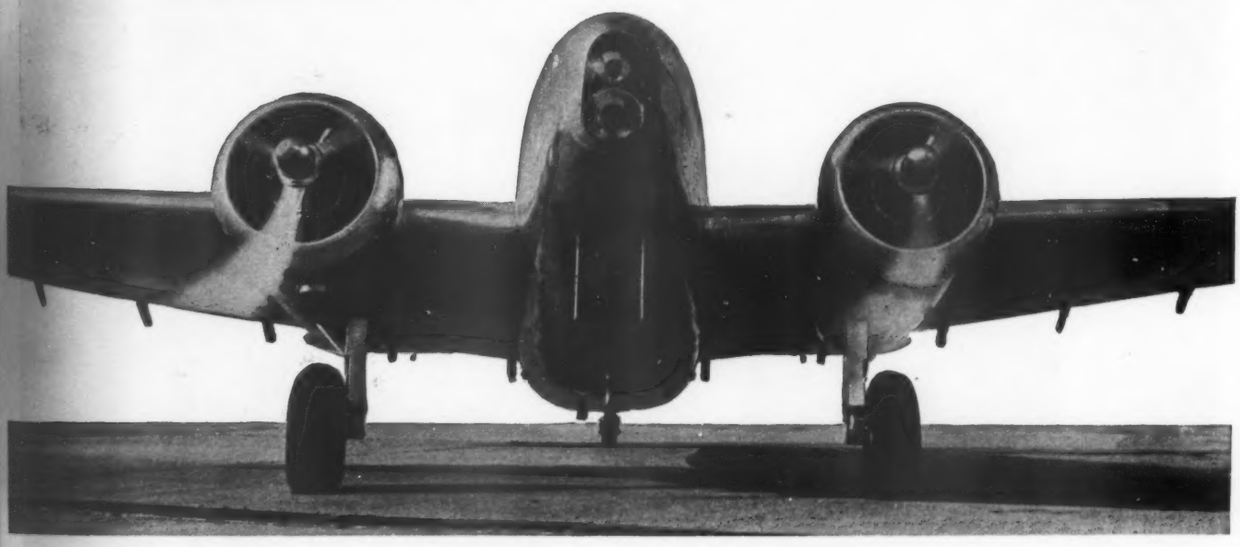
BG

THE BG CORPORATION

Contractors to the United States Army and Navy and Aircraft Engine Builders

136 WEST 52nd STREET, NEW YORK . . . . Cable Address: Golsteco, New York

3 DAYS-19 HOURS-17 MINUTES!



EAGERLY the world looked on as Howard Hughes, Lt. Thomas L. Thurlow of the United States Army Air Corps, Harry P. M. Connor, Richard Stoddart and Edward Lund completed their record-breaking flight around the world. Enthusiastically the world hails their achievement!

SPERRY is particularly gratified that the speedy Lockheed "New York World's Fair 1939" carried a full complement of SPERRY instruments, including Directional Gyro, Gyro-Horizon, and Gyropilot with remote control for the navigator — all of which performed perfectly during the entire flight.

SPERRY GYROSCOPE CO.

INCORPORATED

MANHATTAN BRIDGE PLAZA, BROOKLYN, N. Y.

EXIDE RODE WITH HOWARD HUGHES AROUND THE WORLD

It took her just *5477 minutes* to flash around the world, proving that the mighty Earth's a midget to a stout ship and brave men.

YOU planned it and you did it, Howard Hughes and your crew—well done! We are proud that Exide Batteries were part of your careful plans... Exide Aircraft-type batteries started Howard Hughes' ship, and furnished the current needed for landing lights, navigation lights, and instrument lights. These same dependable Exides supplied the major portion of the current required to send radio messages, and they stood by faithfully ready to furnish power when needed.

Exide World-Wide Service strikingly demonstrated by the flight... Duplicate Exide Batteries, fully charged, waited at the Paris, Moscow, and Fairbanks landing fields, in case Howard Hughes might need them.

Exide

AIRCRAFT BATTERIES

With Exide **MIPOR** Separators

"MIPOR," Reg. U. S. Pat. Off.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

14,716 Miles, at 206.7 Miles per Hour!
FLYING ON

INTERNATIONAL NEWS PHOTO

*The NORMA-HOFFMANN line of 108 distinct series and over 3000 sizes affords PRECISION BEARINGS of time-tested reliability—for engines (including superchargers), engine accessories, control apparatus, instruments, radio equipment, cameras, and landing field equipment. * * * * Write for the Catalog. Let our engineers work with you.*

Once again, by their performance in an epochal achievement, have NORMA-HOFFMANN PRECISION BEARINGS justified the confidence and approval of aviation experts. For such a supreme test as this, only bearings of proved dependability could be selected.

The Lockheed Plane (Lockheed Aircraft Corp., Burbank, Calif.) piloted by Howard Hughes in his record-breaking 'round-the-world flight, employed NORMA-HOFFMANN PRECISION BEARINGS in its control system, as well as in its Pioneer, Sperry and Kollsman instruments, and in the Fairchild radio compass Mark RC-4.

"Where the bearings must not fail—on land, at sea, or in the air—choose NORMA-HOFFMANN PRECISION BEARINGS!

NORMA-HOFFMANN BEARINGS CORPN., STAMFORD, CONN. U.S.A.

"If I were an ADVERTISING MANAGER"

That's just one of the talks to be delivered anonymously by a masked speaker that will set every man thinking at the Annual Conference of National Industrial Advertisers Association in Cleveland, September 21-23. A second masked speaker will tell what he would do if he were a publication representative.

We're not going to tell you much here—just highlight the program enough to make your mouth water and your brain tingle.

T. M. Girdler, Chairman, Republic Steel Corporation, is scheduled for the opening address and when "T. M." talks he says something.

J. H. McGraw, Jr. will talk on "What I Would Do *Now* If I Were An Industrial Advertising Manager."

The new Publisher's Statement will receive full discussion.

Clinic sessions, so popular last year, will again cover a wide range of interesting subjects. Two half-day sessions instead of one.

A general conference session will cover such subjects as "Preparing the Plan", "How to Gather Usable Material", "Copy Technique", "How to Sell Management", "Co-ordinating Sales and Advertising" and "How and Why to Use an Industrial Agency."

Another session will deal with "Problems of the Small Advertiser", "Production Problems", "Public Relations"—and there are many others.

If I were an Advertising Manager, I certainly would start now to make plans to attend the 16th N. I. A. A. Conference even if I had to hitch-hike to Cleveland. And I would send in my advance registration now to—Ed. Bossart, Bailey Meter Company, Ivanhoe Road, Cleveland, Ohio.

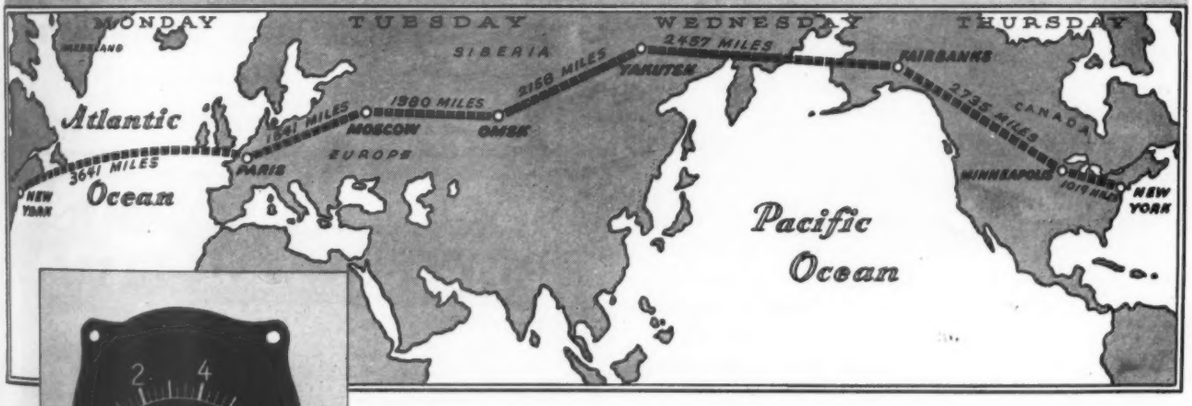
IF I EMPLOYED AN ADVERTISING MANAGER—I would make certain that he attended this Conference, because changing times and markets demand a changed viewpoint—a new viewpoint that can be obtained only by hearing discussions by men whose experience is up-to-the-minute—right up to September 21st.

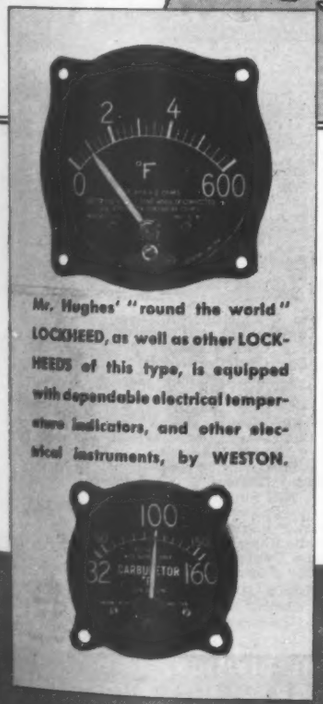
NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION

100 EAST OHIO STREET • CHICAGO, ILLINOIS

HOWARD HUGHES' SUCCESSFUL FLIGHT

. . . the result of careful planning



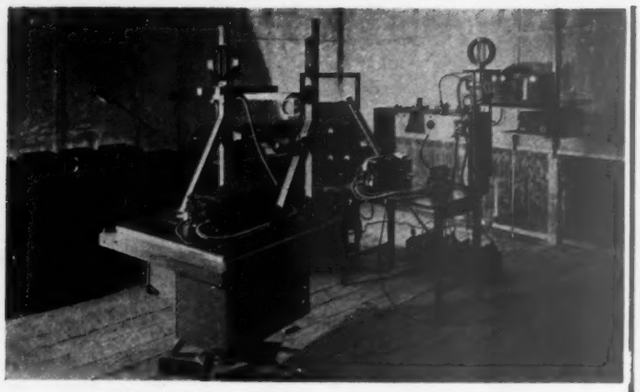


Mr. Hughes' "round the world" LOCKHEED, as well as other LOCKHEEDS of this type, is equipped with dependable electrical temperature indicators, and other electrical instruments, by WESTON.

WESTON salutes Howard Hughes, his flight associates, and the entire **LOCKHEED** organization on such skillful, sound planning.

Weston Electrical Instrument Corporation, 616 Frelinghuysen Ave., Newark, N. J.

WESTON *Instruments*



Research
Careful Testing
Thoughtful Planning

. . . . . these factors determined the success of the *HUGHES ROUND-THE-WORLD FLIGHT* in which the FAIRCHILD RC-4 RADIO COMPASS proved its worth as a radio avigational device.

These same factors have contributed to the development of the Fairchild Radio Compass through constant research, service testing, and manufacturing experience . . . over 1,000 units are in use in 14 countries throughout the world.

Wiley Post in his round-the-world solo flight used a Kreusi Radio Compass (forerunner of the present Fairchild Radio Compass). Following this, Fairchild produced the E-4 Radio Compass units in quantity for the U. S. Army Air Corps . . . the commercial model RC-3 used in the Russian trans-Polar flights . . . climaxed by the model RC-4 in the Hughes round-the-world flight.

FAIRCHILD AERIAL CAMERA CORPORATION

88-06 Van Wyck Boulevard
Jamaica, L. I., New York

Good Pilots Die in Bed!

But

Pilots—*like other people*—
Ground-loop out of bathtubs!
Tail-spin off ladders!
Power dive down stairs!
Take-off from banana peels!
Side-slip out of chairs!
Taxi into oncoming cars!

Pilots—like other people—need accident insurance to cover ordinary accidents as well as Flying Risks.

Pilots—like other people—now for the first time can get every type of accident coverage under one Policy:

Aero Age

ISSUED SOLELY THRU

AERO INSURANCE UNDERWRITERS

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New York City

Chicago Kansas City Los Angeles

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. . . Complete lists covering industry's major markets

5 IRVIN CHAIR CHUTES were chosen for this world flight

Irving Air Chute Company

Congratulates

HOWARD HUGHES

IRVIN Air Chute — The Life Preserver of the Air

and his globe-girdling crew on their remarkable contribution to aviation.

IRVING AIR CHUTE CO., INC.

1670 Jefferson Avenue, Buffalo, New York

Factories at: Buffalo, N. Y.; Glendale, Calif.; Fort Erie, Canada; Letchworth, Herts, England.

LANDINGS

Around the World

- With the Hughes Record Making Flight
- As Standard Equipment on Lockheed 14's

The successful hydraulic actuating system on the Hughes record-breaking Lockheed 14, as well as on the Lockheed 14's in service in practically every country in the world . . . indicates the complete dependability of our hydraulic control systems.

AIRCRAFT ACCESSORIES CORPORATION

Cable Address "AIRCORP" Glendale, California

Leach relays have proved their reliability with Howard Hughes on his splendid around the world flight.

And with American planes in daily service throughout the world.

Leach relays are engineered for aircraft requirements.

LEACH RELAY COMPANY

5915 Avalon Blvd. Los Angeles, Cal.

HOWARD HUGHES

makes **SOLAR** *news*

Solar manifolds were specified by Howard Hughes for installation on his round-the-world Lockheed model 14.

There is no substitute for experience.

It pays to specify "Exhaust Manifolds by Solar."

SOLAR EST 1927

SOLAR Aircraft COMPANY

LINDBERGH FIELD SAN DIEGO • CALIF

Advertisers in business papers enjoy widest consideration when industry buys . . .

and widest REPUTATION for quality of PRODUCT.

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET, NEW YORK, N. Y.

Offices in — ATLANTA • BOSTON • CHICAGO • CLEVELAND

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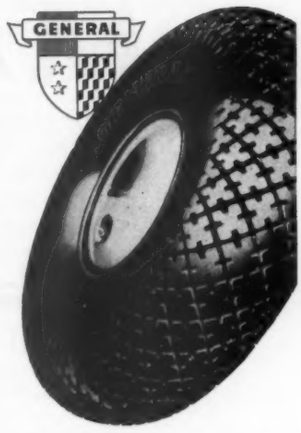
HUNDREDS OF TEST PILOTS WORK FOR EACH SPORTSMAN PILOT

• As a Sportsman pilot you don't have the means of thoroughly testing equipment before buying. Yet, you needn't feel handicapped.

• Rigid tests are constantly being made by the airlines, manufacturers, Army, and Navy. Let their choice be your guide in buying.

• In that group, the long list of General tire users reads like the roll call of American Aviation. It's your recommendation that Generals will do a job on your plane.



GENERAL TIRE & RUBBER CO.
AKRON • OHIO

GENERAL *Airplane Tires*
KNOWN ROUND THE WORLD FOR SAFETY !

B★A★30

B★A★30 airplane wing cloth is lighter, stronger and more closely woven than other airfoil fabrics. Inquiries from dealers and manufacturers will receive prompt attention.

WELLINGTON SEARS COMPANY 65 WORTH ST. NEW YORK CITY

Emblems—Service Pins—Watches
Trophies
Wristlets

JOHNSON
NATIONAL INSIGNIA CO., INC.
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N. Y. City
Est. 1894

PARTS · SUPPLIES · SERVICE
PACIFIC AIRMOTIVE CORP.
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AVIATION EQUIPMENT & EXPORT • INC.
29 Thayer Street, New York City, U. S. A. Cable Address: AVIQUIPO

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USED PLANES, ENGINES AND PARTS FOR SALE, TRADE OR WANTED
SPECIAL SERVICES OF DISTRIBUTORS, FIXED BASE OPERATORS, ETC.
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For your convenience it now appears in an easier-to-read type face and the exclusive indexing feature of Aviation "Classified" is supplemented with the group classification of one-plane ads. Check the groups and the index for ads of planes or other items that interest you. Jot down the numbers given and consult these ads. Numbered ads appear in numerical order. See how easy it is to use Aviation's Market Place to Buy. Use it when you want to Sell.

Used Planes

for sale—Grouped by Make

See index for additional planes offered in other ads. Ads appearing in group form are keyed to indicate that they also cover P—Parts T—Trades W—Wanted

Aeronca

1938 AERONCA K, six months old, total 100 hours same as new extras, wheel pants, tail wheel, brakes, etc. Will sell for real bargain. Write J. T. Moore, 15½ So. Perry Street, Montgomery, Ala.

AERONCA C-3 in excellent condition. Licensed until May, 1939. $700.00. August Riner, 110 Wildwood Avenue, Cincinnati, Ohio.

American Eagle

OX5 AMERICAN EAGLE, Licensed to April 1939. Completely millerized motor, dual controls, fabric and appearance good. Sell at best offer. L. E. Schroeder, 4551 Ray Street, St. Louis, Mo.

AMERICAN EAGLE: Newly licensed, excellent condition, $300. Arthur Fannin, 2333 Plum St., Newcastle, Ind.

Aristocrat

ARISTOCRAT, 102F 3 PCLM. Powered with Continental A-70, 165-HP. Just majored. Licenses until April 19, 1939. Sell Cheap. Tom Saliba, Mariann, Fla.

Arrow

ARROW V-8 MASTER, compass, brakes, tailwheel, lights, airspeed. 20 hours total, modernized water pump, large crankcase, Gullwings. Licensed March 1939. Best used Arrow on market. Will accept any reasonable cash offer. J. A. Wales, Jr., Stratford, Conn.

Avro Avian

AVRO AVIAN, A1 condition being relicensed now. Motor 160 hours, ship 450. Air wheels. Best of condition throughout. $400 cash. George M. Austin, Perry, N. Y. R.2.

Caproni

CAPRONI 2 P.O.L.B. D-H Gipsy. Airwheels, Oleos, Airspeed Compass. $650.00. Trade on car. Lou Jacobson, 154 East 87th Street, N. Y. C. (T)

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AVIATION "Classified"—August, 1938

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Cessna

FOR SALE OR TRADE: Warner Cessna 4-place licensed. Blind flying instruments, steel propeller, airwheels, tailwheel, NACA Cowling, price only $1195. Two Russel parachutes. Just repacked. $75. each. John Ruzicka, Peru, Indiana. (P) (T)

Eaglerock

EAGLEROCK A4, Wright Simplex engine, licensed, excellent condition, special paint job, Bendix brakes, total time less than 200 hours with extra model E Hisso prop and miscellaneous parts and tools and two Irving standard 24 ft. seat pack silk parachutes. $1000.00. T. B. Herndon, Mansfield, La. (P)

CHALLENGER A4 Eaglerock 750, 36 Cut 800. Hisso 180 HP motor with all Conley mount and radiator. Hamilton Steel Prop for Hisso or J5. Curtiss Reed Prop. Need Hamilton Steel Prop for Challenger or Hub. Steve Shalbreck, Rhinelander, Wisconsin. (W) (P)

Eastman

EASTMAN AMPHIBIAN excellent condition, motor majored, $1500.00. New Orleans Air Lines, 1131 Lesseps Street, New Orleans, La.

Fairchild

FAIRCHILD 24 DE LUXE late 1936, Warner 145 engine, just majored, flaps, pants, electric starter, brakes, generator, bank and turn, rate of climb, clock; steerable tail wheel. Excellent condition. Just relicensed, $4250. W. A. Speer, 3330 Barnett Avenue, San Diego, California.

FAIRCHILD 21 Kinner B5 engine. Plane and engine in perfect condition. Never cracked. Extra equipment. Price $1300. Ralph Wilson, Westhampton Beach, N. Y.

FAIRCHILD—LATE 1937—Warner 145 h.p. Deluxe 4 place cabin—only 130 hours blind flying group—radio—pants—ivory and blue hand rubbed paint job—Dudley Flying Service—Municipal Airport—Nashville, Tennessee.

Fleet

FLEET MODEL ONE Warner 125 engine just completely recovered and engine majored, unrestricted, steel prop, large rudder, radio, finished all Loening yellow, licensed till June 1, 1939, $1650. W. A. Speer, 3330 Barnett Avenue, San Diego, California.

AVIATION'S MARKET PLACE

Ford

FORD: J-5. Excellent condition, 80 hours since major on ship and motors, licensed Sept. 1938. First and last price $3750. No brokers. Rafus Flying Service, Greensboro-High Point Airport, Greensboro, N. C.

Franklin

FRANKLIN SPORT VELIE 65 H.P. Motor just majored. Finished all yellow. Excellent condition. Extras. $695.00. Can finance. Al Leeward, New Kensington, Pa.

Howard

HOWARD DGA8. 1937 Wright 320 HP. 387 Hours, blind and night flying instruments, two-way radio, $8900.00. Reg Robbins, Municipal Airport, Ft. Worth, Texas.

Kinner

KINNER LOW WING SPORTSTER. 100 horse power Kinner engine, starter, brakes, tail wheel. Licensed till December 1, 1938, $1750. W. A. Speer, 3330 Barnett Avenue, San Diego, California.

NEW KINNER STANDARD D-29 Trainer: Recovered, relicensed. 2S class, wonderful student ship. In excellent condition. $950. Mid City Flying Service, Hudson, Ohio. No. 49

Lincoln

LINCOLN Two place biplane. 100 HP Kinner. Good condition. Licensed, duals. $650.00. Don Wilkes, 208 N. Glen Oak, Peoria, Illinois.

Monarch

OX5 Monarch Biplane. Can be licensed. Motor just overhauled. High Speed Prop. Price $225.00 cash. At Janesville Flying Service Field. Roy A. Hiller, 514 St. Marys Ave., Janesville, Wisc.

Monocoach

MONOCOACH Wright J6-7, 4 place cabin, Gloss finish in blue and yellow, equipped for night and blind flying, 2-way radio, just relicensed. Ideal ship for altitude or charter work. Used as weather ship. $1800. Knapp Flying Service, Municipal Airport, Nashville, Tenn.

Monocoupe

LAMBERT MONOCOUPE. Racing gear, steel propeller, navigation, cabin lights, rate climb, turn bank, airspeed, factory rebuilt. Motor with ring licensed June, 1938. Price $1195. Kenneth S. Schneider, 1001 Montvue Rd., Anniston, Ala.

LAMBERT MONOCOUPE: Just relicensed, prop etched, duals, two doors, pants, speed ring. $1,200. Can be financed. Mid-City Flying Service, Hudson, Ohio.

MONOCOUPE: 125 HP front exhaust Kinner; airwheels. Perfect shape throughout; $1,100.00. J6-9 engine, modernized, 50 hours since top overhauled; excellent running condition; $600.00. Jerry Wood, 1238 N. Lombard Avenue, Oak Park, Ill.

125 WARNER MONOCOUPE. Entire ship in first class condition. Pants, ring, radio shielding, several extra instruments. Never cracked. A snappy job. Bargain for cash. Charles A. Beck, 552 Park Avenue West., Mansfield, Ohio.

Parks

OX5 PARKS, rebuilt and licensed August 1937. Flown 25 hours since. $400.00. See Fred Hopp, Tilden, Illinois, or William Hopp, 2421 Third Street, Ocean Park, California.

Robin

ONE CURTIS ROBIN OX 5-cabin, 3 place. Licensed, recently overhauled, new paint, very good condition. Cheap. Price F.O.B. Lake Delton Airport, Lake Delton, Wis. Write for particulars. R. M. Hines, Dellview Hotel, Lake Delton, Wis.

Robin — Continued

CHALLENGER ROBIN; 140 since major, newly recovered, new upholstery, custom instrument panel, tail wheel, lights and generator, duals. Licensed till September 1939. Hangar 7, Roosevelt Field, Long Island, N. Y.

Ryan

MUST SELL, J5, five place Ryan cabin land monoplane. Engine and ship completely majored, no time since overhaul. Beautiful hand rubbed finish, many extras. Priced for quick cash sale. Write or wire, T. Johnson, 101 Searing Avenue, Mineola, New York.

RYAN 1937 ST-A, good condition, 125 HP Menasco in nose, dual brakes and controls, flaps, wired for night flying, standard instruments. Selling for $3500. Matamoras Airways Inc., Matamoras, Penna.

RYAN B-3 CABIN, just recovered, color brown. Motor just majored. Wright Whirlwind 330 HP in nose, standard instruments, equipped for banner towing. Sacrifice at $1100. Matamoras Airways Inc., Matamoras, Penna.

Sikorsky

2 SIKORSKY S-38. Wasp c Motors-Controllable Props—Twoway Radio. Complete over water flying equipment. Good condition ready to fly at Morrison Field. W. Palm Beach, Fla. Write Palm Beach Aero Corp.

Stinson

STINSON RELIANT SR-5, excellent condition, always privately flown, never damaged. New tires and battery. Well equipped, fine upholstery, 75 gallon gas tanks, landing lights, turn and bank, rate of climb, brand new RA radio. Approximately 150 hours since factory major overhaul. Total hours approximately 500. Price $3,000.00. Harry G. Ballance, Blevins Hangar, Candler Field, Atlanta, Ga.

STINSON SM8A. Privately owned. Beautiful high Gloss finish, interior spotless. Few hours since overhaul. Licensed to July 1939. Must sacrifice for cash. Aeroways, Inc., Cleveland Airport, Cleveland, Ohio.

STINSON '(S) LYCOMING. Full set of instruments, Kollsman sensitive Altimeter. Generator. Radio. Blue and orange. Price $1600. Elmer Browne, Ford Airport, Lansing, Illinois.

STINSON GULL WING: Controllable propeller, Many extras, never cracked, 130 hours. Bargain. FS 448, Aviation, 330 West 42nd Street, N.Y.C.

STINSON SM 2AC—Wright J-6-7, 250 HP. Licensed to April 1939. Forty hours since major. Must sell. Shupe Flying Service, Dudley Hotel, Brookings, S. Dak.

1934 STINSON SRS RELIANT. No time since complete motor major, just relicensed. Absolutely must be seen to be appreciated. Never cracked. Real bargain. Can finance. Al Leeward, New Kensington, Pa.

STINSON, Warner 125. Only 30 hours since complete rebuild, recover, motor major, special high glass finish, relicensed, extras. Sacrifice for cash. J. A. Wales, Jr., 230 Park Avenue, New York City.

Taylor (Cub)

CUB 1937 just completely recovered, and engine majored, finished all white steerable tail wheel, navigation lights, licensed till March 1939, $1050. W. A. Speer, 3330 Barnett Avenue, San Diego, California.

CUB LATE '36. Motor majored. Hand rubbed finish. Total time 195 hours, none since overhaul. New prop and tires. $850. Leroy Murphy, Municipal Airport, Springfield, Illinois. No. 51

TWO 1937 CUBS; NC17574 yellow; NC1J936 green; in good condition, dual equipment, motors just majored, tail wheels. $800 each. Matamoras Airways Inc., Matamoras, Penna.

Taylor (Cub) — Continued

1937 DELUXE CUB SEAPLANE, landplane, Edo floats, dual ignition, metalized, many extras, entire outfit excellent. Can finance, bargain, Al Leeward, New Kensington, Pa. (P)

LATE '35 CUB. Newly licensed A40-3 just factory majored. Waxed Dianna Cream. Plenty extras, perfect flyer, perfect condition. $750. Mercury Airport, Hammondsport, New York.

TAYLOR CUB E-2: Late 1934; slightly cracked. Price $250.00. James P. Kelley, Southold, L. I., New York.

Taylorcraft

TAYLORCRAFT '38 privately owned, never cracked. Total time 58 hours. With compass bracks, tail-wheel, wheel pants, carburetor and cabin heater. Hand rubbed. Finished cream and red. $1425.00. Cash. L. Ciccarelli, 333 Adams St., Steubenville, Ohio.

TAYLORCRAFT 1937, Fine condition, 315 hours on motor, 35 hours since major. Licensed to May 1939. Never cracked, always hangared, finish and Pyralin like new. Price $1,150. Hillyer Bennett, Mohopac Falls, N. Y.

Travelair

TRAVELAIR: 4-place cabin monoplane, Type 10-D; in excellent condition. Just relicensed. 715 hours. J6-7 motor, Price, $1,650. H. C. Noll, Omaha, Nebraska.

TRAVELAIR 4000—J-5 Mount complete less engine. Good condition. Tail wheel. Extra instruments. Priced right. E. M. Laird Airplane Co., 5919 S. Cicero Avenue, Chicago, Illinois.

TRAVELAIR Sport Trainer. 550 hours, spare motor, blind instruments, Thermocouple, Stainless Steel Wires, Brakes, tail wheel. Perfect condition. Borcherdt, 1044 Forest, Wilmette, Illinois.

Waco

WACO CUSTOM CABIN, 5 place. Built May 1936; Jacobs 285, 145 hours, RCA radio, turn and bank, rate of climb, flares, special paint, Kensington and Fokker Red, Ship and motor like new, given perfect care. Waco A, 125 Warner, 160 hours, Red & Silver, starter, airspeed, and all standard instruments. Best buys in the country. J. Wayde Stewart, 1319 Avery St., Parkersburg, W. Va.

WACO F-Warner. 125, steel Prop, brakes good shape, cheap. Philip S. Van Syckle Vail, N. J.

WACO 1933 CABIN. $2,000.00 for quick sale. Continental 21 h.p. Motor modernized, lights, flares, 70 gallon gas tanks, bank and turn, rate of climb, wheel pants, steel propeller, radio. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio.

WACO "A" Jacobs 170; 20 hours since rebuilt. Always privately owned, hangared, never cracked. Licensed July, 1939. Must sell; $1400.00. J. Gilbert Leigh, Jr., 210 Louisiana St., Little Rock, Ark.

Used Planes—General

(See also Group Classifications)

CHALLENGER ROBIN, A-1 condition $750; Whittelsey Avian, just rebuilt and majored $800; Fairchild 22, A-1 condition $1250; Fairchild 21, majored and perfect shape $1150; Lambert Monocoupe, majored, $2200. Fledg, Robin, and other parts. Aircraft Brokerage, Flushing Airport, Flushing, L. I. No. 1

J-5 STINSON—6-place, just relicensed, $750.00. Waco model D.S.O. Hisso powered, licensed to May 1, 1939, perfect condition, $750.00. Meinke Eldred Flying Service, Lost Nation Airport, Willoughby, Ohio. No. 2

1937 PIPER Cub DeLuxe—43 hours private. Never cracked. Looks and runs like new. Bargain. $995.00. Terms. Also 1937 Aeronca C3, perfect condition. Sacrifice $745.00. Euclid Avenue Airport, Willoughby, Ohio. No. 3

AVIATION'S MARKET PLACE

Used Planes—General — (cont'd)

CESSNA C-37. Perfect condition. Never damaged. 100 hours on ship and motor. Privately owned. Aeronca Deluxe C-3. Extra good. Late model, $750.00. J. L. Wells, Avon Park, Florida. No. 4

NEW 1938 CUB Sport Seaplane Demonstrator only $1775 including extras. Investigate at once if interested. Avian $350, 1938 Cub Sport $1095, Pitcairn PA-7S $900, 1936 Cubs $750 up. 1937 Cubs $895 up. Waco 10-OXX-6, Waco OX5 just majored. Bennett Air Service, Hightstown ("Cubtown"), N. J. No. 5

USED REPOSSESSED AIRPLANES. Most all makes, open and cabin. Terms as low as $100 down. Send for list #807. Finance Department. Pioneer c/o Airport, Syracuse, N. Y. No. 6

COMMANDER, all or any part, Buhl eight Air Sedan, Wasp engines, Faukker F-10, Wheels various sizes. Wanted J4, J5 and late Tank engines. Dean C. Daily, Los Angeles Metropolitan Airport, Van Nuys, California. No. 7

SAVOIA-MARCHETTI Amphibian Kinner 125 — 3-place, excellent condition, $1,350.00. Challenger powered Travelair, Engine majored, fuselage recovered, $1,200.00. Taylorcraft with 200 hours, perfect condition, $1,265.00. Edo Floats, complete for Taylorcraft, $460.00. Meinke Eldred Flying Service, Lost Nation Airport, Willoughby, Ohio. No. 8

Engines & Parts

Also see ads marked (P)

Perfect Circle Piston Rings for any aircraft motor always in stock. Leslie C. Miller's Aviation Supply, 1451 West 3rd Street, Cleveland, Ohio. The man who made the Miller Overhead. No. 9

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PRATT & WHITNEY HORNET T2D1 Engine. Total 302 hours. Two Hamilton controllable 2-bl. Propellers—diam. 6'9". Used 102—804 hours resp. For use above engine or other with SAE 40 shaft. All spare equipment formerly owned, maintained and overhauled by European airline company. Unused since overhaul. FS 442. Aviation, 330 West 42nd Street, New York City. No. 11

Ox-5 PARTS, Miller Overheads and Parts —We have one of the largest stocks in existence at positively the lowest prices—write for complete list. Also, OX-5, Scintilla and Bosch mags, $27.50; used Miller Overheads—perfect—$27.50; Miller rollers 60c; Miller valve guides and seats, 60c each; we replace em, $1.00 each; ship us your cylinders. Leslie C. Miller's Aviation Supply, 1451 West 3rd Street, Cleveland, Ohio. The man who made the Miller Overhead. No. 12

150 H.P. Axelson B Engine. New, in original manufacturer's crate. $375.00 Excellent engine. Walter Barling, Seabright, California. No. 13

PROPELLERS—New production, fresh stock, guaranteed licenseable. OX-5, OXX6, $29.85; Kinner, Warner, Tank, Cirrus, Genet, Gypsey, Lambert, LeBlond, Menasco, $29.85; Taylorcraft, Cub and Aeronca, $22.85. Above prices less spinner. Add $3.00 if spinner required. Leslie C. Miller's Aviation Supply, 1451 West 3rd Street, Cleveland, Ohio. The man who made the Miller Overhead. No. 14

List your surplus supplies with us and call on us for our free listing service on used and new airplanes and parts. Leslie C. Miller's Aviation Supply, 1451 West 3rd Street. Cleveland, Ohio. The man who made the Miller Overhead. No. 15

Equipment & Products

Floats

EDO FLOATS for Cub. Complete with all struts, like new. Real bargain. Also have Cub Seaplane. Bargain. Al Leeward, New Kensington, Pa. No. 16

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Parachutes

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Write us for every aeronautical necessity. Leslie C. Miller's Aviation Supply, 1451 West 3rd Street. Cleveland, Ohio. The man who made the Miller Overhead. No. 20

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Instruction

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Miscellaneous

MEET YOUR FRIENDS, get your mail, make our store your headquarters during the Air Races. Leslie C. Miller's Aviation Supply, 1451 West 3rd Street, Cleveland, Ohio. The man who made the Miller Overhead. No. 25

FELLOWS: Join our new club. Flying costs down to $2.50 per hour. Write today, Service Flying Club, Hangar 5, Floyd Bennett Field, Brooklyn, N. Y. No. 26

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Business Opportunity

WANTED A BACKER! for a new type of aircraft design. If you can drive a car you can fly this ship. Act at once, you have from now to January 1939 to decide; we sail for a foreign country then. BO 440, Aviation, 330 West 42nd Street, New York City.

Wanted

WANTED USED PARACHUTES. Due to the unusual demand for used chutes I am in a position to make liberal allowances for your old chutes toward the purchase of new ones providing they are airworthy. Joe Crane, Irvin Air Chute Dealer, Roosevelt Field.

Employment

Position Wanted

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AERONAUTICAL DRAFTSMAN—Jr. rating. Curtiss-Wright trained. Age 21, single. Desires permanent work in Aviation. Location immaterial. Salary secondary. R. C. McCaleb, 215 Woodbine St., Harrisburg, Pa.

MECHANIC DESIRES AIRPORT WORK in east, any mentioned salary will be considered. Obed Malpass, 1010 So. Sixth St., Wilmington, North Carolina.

"A and E" MECHANIC, licensed. Aviation school graduate. Desires position, travel anywhere, good references. PW 449, Aviation, 330 West 42nd St., New York City.

U. S. Government

WAR DEPARTMENT, Office of the Contracting Officer, Air Corps, Materiel Division, Wright Field, Dayton, Ohio, June 24, 1938. To: Airplane Designers and Manufacturers.—The War Department invites the submission in competition by sealed communications of new designs covering Single-Engine, Radio-Controlled Target Airplane complete with all ground control and operating equipment, together with statement of price for which any such design in whole or in part will be sold to the Government. Communications containing designs and prices therefor must be submitted to the Contracting Officer, Wright Field, Dayton, Ohio, not later than November 16, 1938; no communications received after 1:00 P. M. Eastern Standard Time on said date shall be considered. Winner or winners of this competition will be determined as provided in the Act of July 2, 1926 (44 Stat. 788). The Government will require not to exceed one hundred (100) of the type of airplane referred to and will reserve the right to contract with a winner of the design competition for the construction of said airplanes in the event that said winner is qualified to manufacture same. A copy of the circular proposal covering this design competition and containing instructions in regard thereto will be furnished upon application therefor to the Contracting Officer, Wright Field, Dayton, Ohio. E. T. Kennedy, Major, Air Corps, Contracting Officer.

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Write for Model desired and price you will pay.

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Wayne, Michigan

AVIATION'S MARKET PLACE

9 BARGAINS
CERTIFIED USED PLANES

1936 Fairchild—145 HP—Total 39 Hours. Bonding and Shielding, Starter, Blue and Yellow, Wheel Streamlines, Landing Light. Perfect Condition. $5,250.00

Stinson 1936—260 HP—5 Place. Red and Green, Controllable Propeller, RCA Receiver, Generator, Landing Lights, Flares, Thermocouple, Bank and Turn, Rate of Climb. $5,750.00

Stinson 1937—440 HP. Factory Demonstrator, 2 Shades Red, Constant Speed Propeller, Fuel Analyzer, Landing Lights, Receiving and Transmitting Radio, Large Tanks, Generator, Special Instruments. Price on request.

Stinson 1937—260 HP. Valve Lubrication, Controllable Propeller, Bank and Turn, Vertical Speed Indicator, Red and Beige, Sensitive Altimeter, L65 Compass, Thermocouple, Landing Lights, Flares, Outside Air Temperature Gauge, Fuel Analyzer. $7,410.00

Stinson 1937—260 HP. Green and Black, Green Leather, Controllable Propeller, Generator, Valve Lubrication, Bank and Turn, Vertical Speed Indicator, RCA Receiver, Sensitive Altimeter. $7,350.00

Stinson SR-7B—245 HP. Radio Compass, Controllable Propeller, Red and Blue, Red Leather, Landing Lights, Flares, Generator, Ice Indicator, Sensitive Altimeter, Bank and Turn, Clock, Rate of Climb. $4,985.00

Stinson SR-5E—245 HP. Controllable Propeller, Red Leather, Flares, Receiving Radio, Bank and Turn, Kollsman Altimeter, Compass. $2,000.00

Stinson SM8—210 HP—4 Place. Landing Lights, Bank and Turn, Rate of Climb, New Tires. $1,450.00

Stinson 1937 WRIGHT—320 HP. Yellow and Black, Controllable Propeller, Bank and Turn, Generator, Sensitive Altimeter, Vertical Speed Indicator. $8,500.00

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Ten Place Planes with Wright Cyclone Engines; New and Used Planes Available.

ENGINES

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Pratt & Whitney	Hornet (Geared)	575
Pratt & Whitney	Hornet	525
Pratt & Whitney	Wasp	450
Wright	J-6	300
Curtiss	D-12	435
Curtiss	Conqueror	600

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One **Fleet** with a K 5 engine overhauled, relicensed and refinished for only $1,250.00.
One 1937 **Taylorcraft** with only 100 hours —Best offer accepted on this airplane.
One **Waco 9**—$150.00 as is.
One **Swallow** with Kinner engine as is for $450.00.
1936 **Cubs** priced from $600.00 up. We can use a **Ford Tri-Motor** or new **Cubs** in trade on any of the above airplanes. What have you?

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Telephone Garden City 3308
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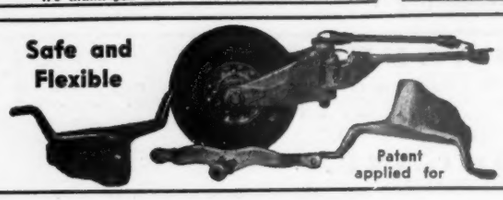

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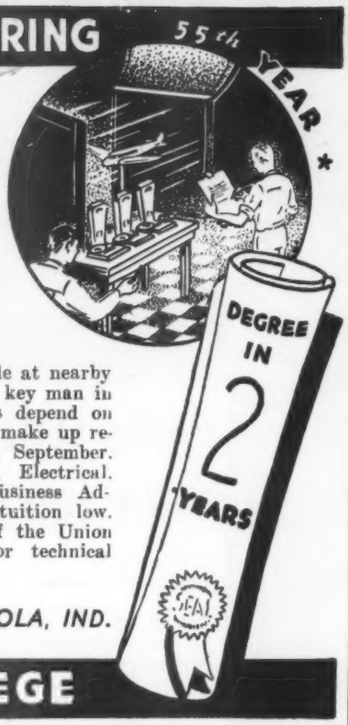

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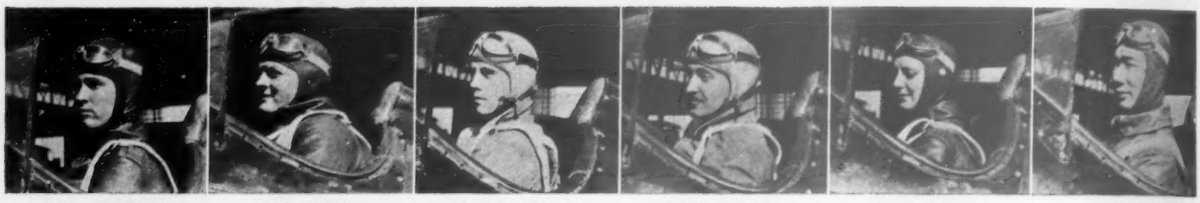

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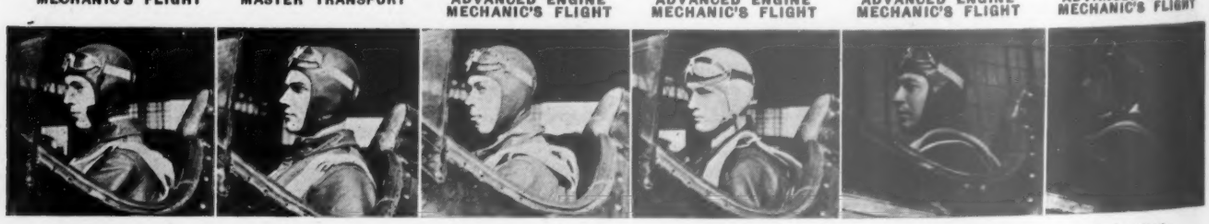

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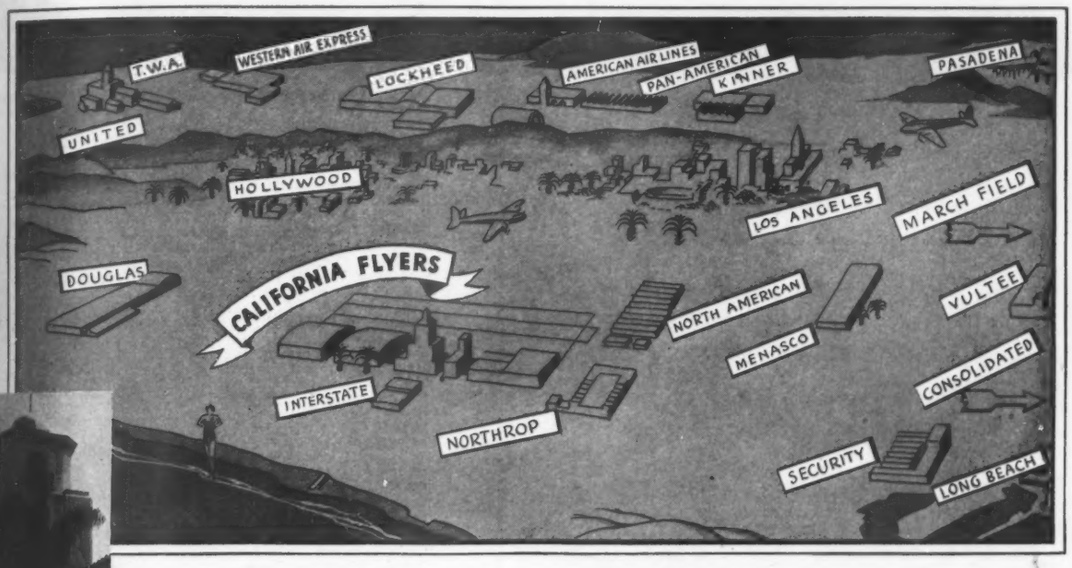

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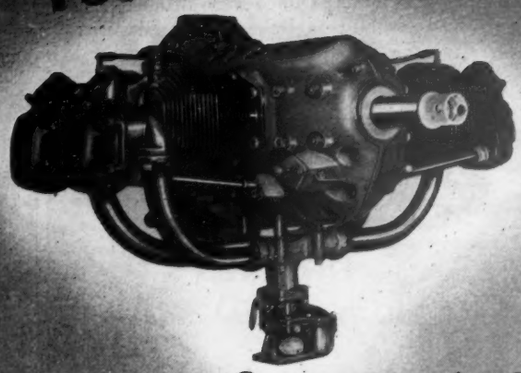

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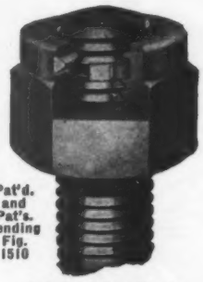

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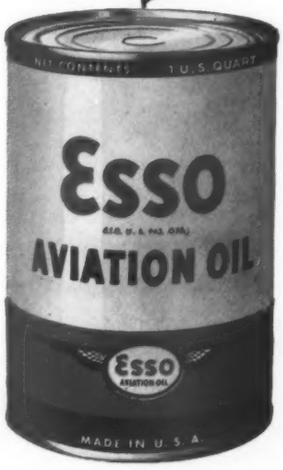

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